Lymph Notes

in Pediatrics

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Growth & development

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **List 5 causes affecting physical growth. (June, 2007)**
   Mention factors contributing to physical growth in children. (June, 2009) (September, 2010 & 2011)

➔ *Physical growth:*

- Increase in mass & dimensions of the body.
- It includes the following aspects: weight, height (length) & head circumference.

➔ *Factors affecting physical growth:*

1. *Race:*
   - There is racial difference in rate and pattern of growth.
   - For example: the Chinese have height lower than other races.
   - So, it's better for every country to use its own growth curves.
2. *Family:*
   Height and body frame are inherited from parents through certain genes.
3. *Sex:*
   - Girls grow faster than boys from 7 months till 4 years and start puberty at a younger age.
   - So, there are growth curves for boys and others for girls.
4. *Chromosomal & genetic disorders:*
   Down syndrome shows retarded growth.
5. *Socioeconomic factors:*
   Poor housing and hygiene and poor health can affect growth.
6. *Nutritional status:*
   - Under-nutrition delays growth.
   - Over-nutrition leads to obesity.
7. *Chronic illness:*
   Chronic renal, liver, chest, cardiac and GIT diseases affect growth.
8. *Chronic infections:*
   As T.B. and brucellosis.
9. *Developmental anomalies:*
   As cleft palate, pyloric stenosis and renal anomalies.
10. *Endocrinal factors:*
    a. *Growth hormone deficiency leads to:*
       - Proportionate short stature.
       - Normal mentality.
       - Normal facial features.

    b. *Thyroid hormone deficiency leads to:*
       - Disproportionate short stature.

- Mental retardation.
- Coarse facial features.

c. *Androgen deficiency leads to:*
- Proportionate short stature as a child.
- Tall as adult (as androgens are responsible for epiphyseal closure so the child grows slowly but will continue to grow for longer period (by GH & thyroid effect).

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2. Discuss the clinical significance of growth curves. (June 2012)

➔ *Growth curves:*

Graphic assessment of physical growth of a child.

➔ *Types:*

1. Percentile curves (most commonly used).
2. Standard deviation curves (more accurate; showing degree of abnormality).
3. Velocity curves (measures change per year for follow up).

➔ *Percentile growth curves (the most commonly used):*

- *Criteria of curves:*
  1. Made for different aspects of physical growth: height, weight & head circumference.
  2. Vary according to:
     a. Sex: Boys & girls have different growth curves.
     b. Country: charts for Egyptian children are now available.
     c. Age: charts for 1st 36 months & charts for children from 2-20 years.
  3. Each chart is composed of 7 percentile curves:

95^{th} percentile: highest normal.
90^{th} percentile: high normal.
75^{th} percentile: above average.
50^{th} percentile: average (mean).
25^{th} percentile: below average.
10^{th} percentile: low normal.
5^{th} percentile: lowest normal.

- *Uses:*
  1. *Single measurement (screening): gives idea if the child is:*
     a. Normal: lies in normal value (95^{th}-5^{th}).
     b. Has abnormal growth ($<5^{th}$ or $>95^{th}$).
        e.g. Weight under the 5^{th} percentile: underweight. Weight above the 95^{th} percentile: overweight.
        So single measure is for screening only (if abnormality detected, refer for further investigations).
  2. *Repeated serial measurements (assess growth rate):*
     a. Any normal child should lie between 5^{th} and 95^{th} percentiles.
     b. Should follow the same percentile level throughout the growth period.
     c. Detect abnormal growth: any deviation from the child's own curve.
     d. Catch up: if a child with undergrowth accelerates his growth rate back to normal.

So repeated measures assess the growth rate.

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3. Define short stature, mention causes, clinical evaluation, investigations and treatment.

➔ *Definition:*

Height below 5th percentile for age and sex.

➔ *Causes:*

1. *Proportionate short stature:*
   a. Normal variant (90%).
   b. Pathological (10%).
2. *Disproportionate:*
   a. Short limbs: Achondroplasia & hypochondroplasia.
   b. Short trunk: Morquio's disease.

A. Normal variants (90%):

	Familial short stature (genetic)	*Constitutional delay of growth and puberty*
Incidence:	Commonest cause of short stature.	Common problem in boys in secondary school age.
Parents	Short.	Normal height.
Family history:	History of previous short stature.	History of delay in puberty.
Growth velocity:	Normal (short since birth).	Normal at birth → short within 2 years (transient decelerated growth).
Bone age:	Normal.	Delayed.
Puberty:	Normal.	Delayed.
Hormonal pattern:	Normal.	Normal.
Final adult height:	Short adult height (lies within mid-paternal height).	Normal adult height.
Treatment:	- Reassurance. - GH may be useful.	Reassurance.

B. Pathological (10%):

1. *Endocrinal causes: (bone age markedly delayed)*
   a. *Growth hormone deficiency:*
      – Panhypopituitarism.
      – Isolated GH deficiency.
      – 2ry to craniopharyngioma (exclude by visual field assessment & CT brain).
      – Loran syndrome: IGF-1 (insulin-like growth factor 1) deficiency.
      – IGF-1 receptor defect.
   b. *Hypothyroidism "decreased cell proliferation":*
      – Congenital.
      – Autoimmune thyroiditis.
   c. *Hypoparathyroidism "decreased calcium deposition in bone".*
   d. *Adrenal gland:*

- Adrenal insufficiency.
- Cushing syndrome:
  - ➔ Anti-vitamin D.
  - ➔ Decreases bone proliferation.
  - ➔ Decreases epiphyseal cartilage proliferation.
- Corticosteroid therapy:
  - ➔ Prolonged high dose (> 5 mg/day).
  - ➔ Alternate day single use reduces the risk.

e. Uncontrolled type 1 diabetes.

2. Genetic & chromosomal disorders:

a. Down syndrome.
b. Turner syndrome.
c. Silver-Russel syndrome.
d. Skeletal dysplasia (achondroplasia).
e. Mucopolysaccharidosis.

3. Severe intrauterine growth retardation (IUGR):

Persistent restricted growth (GH therapy).

4. Nutritional status:

- Malnutrition decreases synthesis of growth factors important for peripheral anabolic action of growth hormone.
- Affects weight more than height.

5. Social short stature:

Psychological deprivation: disturbed child-mother or family relation decreases GH release.

6. Severe systemic disease in infancy & childhood:

- Chronic diseases: as renal failure, mal-absorption syndromes (as celiac disease), chronic hemolytic anemia & liver cell failure.
- Chronic infections: TB & bilharziasis.

➔ *Clinical evaluation:*

A. History: "personal, perinatal, nutritional, present"

- Family history of genetic disease or short stature or delayed puberty.
- History of any chronic illness, drug intake (steroids) or social problems.

B. Examination: "General, chest, abdominal"

1. Measurements:

a) Calculate mid-parental height & target height {(parent sum/2) +7 (in boys) or -7 (in girls)}.
b) Actual height should not be more than 2 SD from target.
c) Height velocity is more sensitive indicator for follow up.
d) Upper segment / lower segment ratio (US/LS) if disproportionate as:
   - In skeletal dysplasia → short LS.
   - Scoliosis or muco-polysaccharidosis (Morquio's syndrome) → short US.

2. Detailed systemic examination to exclude systemic causes.

3. Genital examination & pubertal staging.

C. Investigations:

1. Bone age assessment:

X-ray of left hand & wrist will:

- Diagnose normal variant: differentiate between familial short stature (normal bone age) and constitutional delay in growth & puberty (delayed bone age).
- Reduce unwanted investigations.

2. *Skeletal survey: (achondroplasia).*
3. *If bone age is markedly delayed:*

   Thyroid profile – GH stimulation test – steroids & ACTH – serum phosphate, calcium & alkaline phosphatase.
4. *If pituitary deficiency:*

   MRI brain → craniopharyngioma & brain anomalies.
5. *Others:*

   Anti-tissue transglutaminase (celiac) – karyotyping (turner).

Treatment of short stature:

- 90% are normal variants and require no ttt (just reassurance)
- 10% of cases are pathological. Among the commonest causes are:

  (write the causes & ttt accordingly):

  - Hypothyroidism .. thyroid hormone (write briefly about screening and prevention)
  - Iatrogenic from steroid therapy... stop drug or keep on the lowest possible dose on alternating days
  - GH Def. ... GH therapy
  - Nutrition ... proper diet ... etc

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4. Give reason why: karyotyping is indicated in a girl with short stature.

To exclude Turner syndrome (45, XO) "Discuss from genetics chapter"

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5. List causes of macrocephaly.

→ *Definition:*

Head circumference above 95th percentile for age & sex.

→ *Causes:*

1. *Cranial causes:*
   a. Familial large head.
   b. Chronic hemolytic anemia.
   c. Rickets.
   d. Achondroplasia.
2. *Intracranial causes:*
   a. Hydrocephalus.
   b. Subdural hematoma & effusion.
   c. Brain tumors.
   d. Neurofibromatosis.
   e. Cerebral gigantism (Sotos syndrome).
   f. Mucopolysaccharidosis (Hurler's syndrome).

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6. Causes & evaluation of microcephaly.

➔ *Definition:*

Head circumference below 5th percentile for age & sex.

➔ *Etiology:*

A. True microcephaly:

1. Primary (genetic):

a. Familial (autosomal recessive).
b. Autosomal dominant.
c. Syndromes: Down (trisomy 21), Edwards (trisomy 18), Cri du chat (deletion of tip of short arm of chromosome no. 5).

2. Secondary (non genetic or acquired):

Destructive process affecting the brain during fetal & early infancy.

Causes (same as CP and mental retardation):

i. <u>Prenatal causes:</u>

a. Congenital infection: as rubella & cytomegalovirus (TORCH).
b. Irradiation.
c. Toxins.
d. Drugs: fetal alcohol syndrome, fetal hydantoin syndrome.

ii. <u>Natal causes:</u>

Hypoxic ischemic injury.

iii. <u>Postnatal causes:</u>

a. Kernicterus.
b. CNS infection: meningitis-encephalitis.
c. Intracranial hemorrhage.

B. Craniostenosis (craniosynostosis):

- Premature closure of skull sutures.
- When generalized (multiple sutures), it leads to microcephaly with motor & mental retardation.

1. Isolated congenital defect.
2. Genetic syndromes: as Crouzon syndrome (+ exophthalmos).

➔ *Clinical evaluation:*

1. History:

a. Prenatal: drug intake, infection, exposure to irradiation, ..
b. Natal: obstructed labor.
c. Postnatal: meningitis, neonatal jaundice (kernicterus).
d. Motor & mental development (mental retardation is a common association).
e. Family history maybe +ve in familial cases.

2. Examination:

a. Measure head circumference at birth: small circumference indicates intrauterine insult.
b. Serial measurements are more important.
c. Associated dysmorphic features & congenital anomalies.
d. Assessment of motor & mental development.
e. Palpation of sutures: palpable in craniostenosis.

3. *Investigations:*
   a. **X-ray: small-sized head.**
      - *Craniostenosis:*
        ➔ Small malformed cranium + silver beaten appearance.
      - *True microcephaly:*
        ➔ Small cranium.
   b. **Karyotyping:** Down syndrome & familial cases.
   c. **TORCH screening.**
4. *Differential diagnosis:*

   True microcephaly should be differentiated from Craniostenosis which is characterized by:
   a. Palpable ridge in the region of prematurely closed suture.
   b. Papilledema & other manifestations of increased intracranial tension.
   c. Skull deformities.
   d. Skull X-ray: silver-beaten appearance.

OTHER TOPICS:

1. Parameters of physical growth (MCQ & oral)

1. **Weight:**
   1. *At birth:*
      - ➔ 2.5-4 kg (average 3 kg).
   2. *During the 1st year of life:*
      a) *First 4 months: (3/4 kg per month)*
         - ➔ 4 months = 6 kg (**double birth weight**).

      b) *Second 4 months: (1/2 kg per month)*
         - ➔ 8 months = 8 kg.

      c) *Third 4 months: (1/4 kg per month)*
         - ➔ 12 months (1 year) = 9 kg (**3 times birth weight**).
   3. *During early childhood (2-6 years): (2 kg per year)*
      (Weight = (age in years x 2) + 8)
      - ➔ 2 years = 12 kg.
      - ➔ 3 years = 14 kg.
      - ➔ 4 years = 16 kg.
      - ➔ 5 years = 18 kg.
      - ➔ 6 years = 20 kg.
   4. *During late childhood (7-12 years): (2.5 kg per year)*

   ➔ 7 years = 22.5 kg.

   ➔ 10 years = 30 kg (ten times birth weight).
2. **Length & height:**
   - Under 2 years: length is measured in supine position.
   - Above 2 years: height is measured in standing position (by stadiometer).

   1. *At birth:*
      - ➔ 50 cm.
   2. *During the first 4 years:*

Add 25

➔ 1 year = 75 cm.

Add 12

➔ 2 years = 87 cm.

Add 6

➔ 3 years = 93 cm.

Add 7

➔ 4 years = 100 cm (**double birth length**).

3. *Between 4-8 years:*
   - ➔ Height increases about 7 cm per year (9 years = 135 cm).
4. *Between 9-12 year:*
   - ➔ Height increases about 5 cm per year (12 years = 150 cm = **triple birth length**).

3. **Body proportions (upper segment / lower segment):**
   - Lower segment: from symphysis pubis to heel.
   - Upper segment: from crown to upper border of symphysis pubis (or measured by subtracting lower segment from total height).
     1. *At birth:*
        ➔ 1.7:1
     2. *3 years:*
        ➔ 1.3:1
     3. *8 years:*
        ➔ 1.0:1

Value:

Differentiates between proportionate & disproportionate short stature (as in achondroplasia: large head, normal trunk & short limbs).

4. **Head circumference:**
   1. *At birth:*
      ➔ 35 cm.

Add 8

   2. *6 months:*
      ➔ 43 cm.

Add 4

   3. *1 year:*
      ➔ 47 cm.

= 12 cm during the first year.

Add 2

   4. *2 years:*
   1) 49 cm.

Add 1 + 1 (2)

   5. *4 years:*
      ➔ 50 cm.
   6. *6 years:*
      ➔ 51 cm.

Add 2

   7. *12 years:*
      ➔ 53 cm.

= 6 cm only during 11 years.

5. **Fontanels:**

1. *Anterior fontanel:*
   a) *At birth:*
      ➔ 3 fingers (side to side) = 5 cm width.
   b) *6 months:*
      ➔ 2 fingers.
   c) *1 year:*
      ➔ 1 finger.

d) 1.5 years:

➔ Closed.

NB: There is a very wide range of variation in time of closure of anterior fontanel. But, closure before 6 months indicates craniostenosis.

2. Posterior fontanel:

➔ Closed at birth.

6. Dentition:

1. Primary (milky or deciduous) teeth:

a) Central incisor: 6 months.
b) Lateral incisor: 8 months.
c) 1st molar: 12 months (1 year).
d) Canine: 18 months (1.5 years).
e) 2nd molar: 24 months (2 years).

NB:

- Lower jaw precedes upper jaw by 1 month.
- There is wide range of variation in time of eruption.

2. Secondary (permanent) teeth:

a) 1st molar: 6 years.
b) Central incisor: 7 years.
c) Lateral incisor: 8 years.
d) Canine: 10 years.
e) 1st premolar: 11 years.
f) 2nd premolar: 12 years.
g) 2nd molar: 13 years.
h) 3rd molar: 17-22 years.

7. Skeletal maturity (radiological determination of bone age).

Calculated through:

- Appearance of ossific centers.
- Size & shape of ossific centers as they enlarge.
- Fusion of epiphysis with the rest of bone.

1. Simple determination of bone age:

a) At birth:

➔ X-ray knee joint: ossific centers around knee joint are well developed.
➔ Delayed appearance indicates delayed bone age (hypothyroidism).

b) In early childhood (2-6 years):

➔ X-ray left hand & wrist: roughly, one ossific carpal center appears per year:

- 1st carpal bone ossifies at 6 months.
- 1 year = 2 ossific centers.
- 2 years = 3 ossific centers. And so on.

c) In late childhood (6-12 years):

➔ Fusion of epiphysis of distal end of radius & ulna.

2. Accurate determination of bone age:

Special atlases as Tanner are used.

Value:

a) Normally, bone age corresponds to the actual age of the child.
b) Markedly delayed bone age = endocrinal deficiency (hypothyroidism, GH deficiency, or androgen deficiency).
c) Advanced bone age = excess thyroid hormones, GH, or androgens.
d) Normal bone age + short stature = familial short stature or skeletal dysplasia (as achondroplasia).

8. Vital signs:

	Heart rate	*Respiratory rate*	*Blood pressure*
Newborn:	130	55	80/60
6 months:	120	40	80/60
1 year:	120	35	80/60
4 years:	100	25	80/60
10 years:	90	20	110/65

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2. Overweight.

➔ *Definition:*

Weight above 95th percentile for age & sex.

➔ *Causes:*

1. *Simple (exogenous) obesity:*

   Genetic, environmental & psychological factors.
2. *Organic (endogenous) obesity:*
   a. Cushing syndrome.
   b. Hypothyroidism.
   c. Turner syndrome in females.
   d. Klinefelter syndrome in males.
   e. Prader-Willi syndrome (hypotonia, hypogonadism & obesity).

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3. Causes of delayed dentition.

1. Rickets.
2. Hypoparathyroidism.
3. Osteogenesis imperfecta.
4. Ectodermal dysplasia.
5. Cretinism.
6. Down syndrome.

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4. Causes of delayed closure of fontanels.

1) Anterior fontanel:

Same as delayed dentition + hydrocephalus.

2) Posterior fontanel:

Normally closed at birth. Open in cretinism.

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5. State the motor & mental development during the 1st year of. (September, 2009)

➔ *Gross motor development:*

- At birth: head moves from side to side, but the head lags behind the trunk when arms are pulled.
- 1 month: elevate his head slightly while being in prone position.
- 3 months: complete head support.
- 4 months: push with foot.
- 6 months: sits without support + palmar grasp.
- 7 months: hands together (can transfer objects from one hand to another).
- 8 months: sits without support with straight back.
- 9 months: crawling.
- 10 months: standing with support.
- 12 months: walking with support.

➔ *Mental development:*

- 1 month: follows moving objects.
- 2 months: smiles on social contact.
- 3 months: listens to music.
- 4 months: laughs & prefers social contact.
- 6 months: recognizes his mother.
- 9 months: responds to own name and says "Mama, Dada".
- 12 months: waves "Bye-bye", plays simple ball games and understands several words but says only 2-3 words.

N.B.(not a part of the answer)
Rest of milestones are:

➔ *Motor:*

- 15 months: walking unsupported.
- 1.5 years: ascends stairs in a child manner (step by step) & runs stiffly.
- 2 years: descends stairs in a child manner & runs well.
- 3 years: ascends stairs in adult manner (alternate steps) & can ride pedal tricycle.
- 4 years: descends stairs in adult manner.
- 5 years: can hop on one foot.
- Late childhood: fine hand movements are well-developed.
- 6 years: able to write and dress himself.

➔ *Mental:*

- 1.5 years: says about 10 words.
- 2 years: knows about 100 words & says a 3-word sentence (telegraphic).
- 3 years: gives full name, age & sex.
- 4 years: tells a story, counts up to 10 & recognizes 8 colors.
- 5 years: clear fluent speech & asks about meaning of words.

IMPORTANT NOTES:

1. Crouzon`s syndrome → Craniostenosis with exophthalmos.
2. Silver beaten appearance → Small malformed cranium of Craniostenosis by x-ray.
3. Morquio's disease → Mucopolysaccharidosis with short trunk (Disproportionate short stature).

Nutrition

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **Mention the advantage of breast feeding for infant. " 2011/2012"**

A. Nutritional advantage:

➔ The composition is ideal for infant needs:

- *Calories:* 67 kcal/100ml milk
- *Carbohydrates*: 7gm%
  - **mainly lactose**
  - **oligosaccharides:** inhibit of the pathogen by stimulate normal flora
- *Fats*: 3.5mg% main source of energy 50%
  - **fat globules** are small so easy digestion
  - **low amount of volatile fatty acids** "short chain " which are Irritant
  - contain adequate amount of:
    - **Essential FA:** linoleic acid
    - **Cholesterol:** for brain myelination
    - **Omega 3**: antioxidant
    - **very long chain FA:** polyunsaturated FA
    - **Arachidonic acid**
- *Proteins:* 1.2gm%
  - whey: casein ratio (60:40) easy digestion
  - lactoferrin: help iron absorption and protect from INF
  - Immunoglobulins: secretory IGA "protection "
  - less allergic: lower incidence of atopy
- *Minerals:*
  - Ash content 0.2gm %enough for requirement
  - ca/ph. ratio 2:1 "optimal absorption "
  - Fe and Zn deficient but high bioavailability
  - low Na (low rend solute load)
- *Vitamins*:
  - **A** and B complex are **A**dequate
  - C and **D** are in adequate "**D**eficient"
- *Water*: 87.5% sufficient to meet needs

B. Immunological Advantages:

- **Immunoglobulins:** esp. secretory IgA represent 90% of the Ig in milk "mucosal protection"
- **Macrophages:** phagocytosis-lysozyme-cytokines and **complement** production
- **Lymphocyte:** IgA production

- **Bifidus factor:** oligosaccharide favor growth of lactobacillus Bifidus which secrete acids that inhibit growth of bacteria (E-coli) and decrease incidence of diarrhea

- **Lactoferrin:** Fe binding protein –enhance bioavailability of Fe from human milk reducing its bioavailability for bacteria
- **Intestinal growth factor:** help repair of damaged intestinal cells

- **Lysozyme**: enzyme which attack bacterial cell wall
- **peroxides:** attack and destroy bacteria
- **Interferon:** antiviral
- **Bile salt stimulated lipase**: kill giardia
- **Less allergic**: **less incidence** of type 1 DM –HTN

C. *Psychologically:*

- emotional stable child and mother
- skin to skin contact stimulate social development
- strong maternal-infant relationship

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2. Discuss anti-infective properties of breast milk (June 2013,2007)

- **Immunoglobulins:** esp. secretory IgA represent 90% of the Ig in milk "mucosal protection"
- **Macrophages:** phagocytosis-lysozyme-cytokines and **complement** production
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3. Mention the composition of mature human milk and its immunological advantages (July 2014)

A. *Nutritional advantage:*

➔ The composition is ideal for infant needs:

- *Calories:* 67 kcal/100ml milk
- *Carbohydrates***:** 7gm%
  - **mainly lactose**
  - **oligosaccharides:** inhibit of the pathogen by stimulate normal flora
- *Fats***:** 3.5mg% main source of energy 50%
  - **fat globules** are small so easy digestion
  - **low amount of volatile fatty acids** "short chain " which are Irritant
  - contain adequate amount of:
    - **Essential FA**: linoleic acid
    - **Cholesterol:** for brain myelination
    - **Omega 3**: antioxidant

        - **very long chain FA**: polyunsaturated FA
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    - *Proteins:* 1.2 gm%
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4. How to ensure successful breastfeeding for the healthy newborn (July 2015)

See Neonatology chapter.

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5. Enumerate factors affect human breast milk production and factors that help maintenance of adequate milk flow (May 2017) (June 2008)

➔ *Factors increase milk production:*

a) Frequent mother-baby contact after delivery
b) Rooming in: keep baby in mother's room NOT nursery
c) Demand feeding " feeding according to infant desire" like crying.
d) Avoidance of bottle supplements

➔ *Factors decrease milk production:*

a) Mother and baby separation

b) Feeding babies in nursery at night
c) Scheduled feeding (feeding at fixed time)
d) Routine offering of supplemented bottle.

➔ *Factors that help maintenance of adequate milk flow are:*

a. Good positioning and suckling is the main stimulus.
b. Complete evacuation of the breast.
c. Good nutritional state of mother:
    1. adequate calories, ptn, vitamins and fluids
    2. Avoid onion, spices and chocolates > secreted in milk causing colicky pain to the child.
    3. Avoid smoking and alcohol.
d. Good psychological state of mother: relaxation – happiness – confidence.

+ Discuss how to ensure successful breastfeeding for the healthy newborn

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6. Indications for adequate breast milk intake (Sep. 2007)

A. Infant:

1. Baby is satisfied and sleeps after feeds for **2** hours.
2. Stool: **4** or more motions/day of soft yellow stools.
3. Urine: urinate **6** or more
4. Baby feeds at least **8** times/day
5. Weight gain at rate 250gm/**10** days in the first 4 months.

B. Mother:

1. Marked filling of breast before feeds.
2. Let down reflex: the release of milk due to oxytocin secretion in response to suckling or hearing the baby cry.

N.B: keep in mind that:

- **overfeeding** is accompanied with increase in baby crying, polyuria, vomiting, colic and increase in weight gain
- while **underfeeding** decreases sleep, oliguria, constipation and failure to thrive.

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7. Describe why fresh animal milk is not suitable for feeding infants below one year of age (Sep. 2010)

A. Immunological disadvantages:

- Potent allergen.
- Deficient of needed Immunoglobulins and other protective immune cells.

B. Nutritional disadvantages:

1. **CHO**:
   Doesn't contain oligosaccharides needed for stimulation of flora that inhibit pathogens.
2. **Fat**
   - Absent Lipase enzyme needed for digestion.
   - Larger fat globules → difficult digestion.
   - High amount of volatile fatty acids → GIT irritation.
   - low amount of: essential fatty acids, very long chain PUSFA, Cholesterol and omega3.

3. **Protein**
   - Higher protein content overloading the baby.
   - No lactoferrin hence decreased Fe absorption.
4. **Minerals**
   Higher Na content → high solute load.

---

8. Mention maternal causes that makes breast feeding difficult and how to manage each. (2009, 2012)

A. Nipple soreness

➔ *Causes:*
Improper attachment to nipple.

➔ *Management*:

a. Proper positioning and attachment
b. Begin nursing on less affected side
c. Nursing for shorter periods
d. Pumping in severe cases

B. Retracted (flat) nipple

➔ *Cause:*
Developmental anomaly

➔ *Management*:
Massage & drawing the nipple out before delivery and before feeds

C. Breast engorgement

➔ *Causes:*
Incomplete breast evacuation due to:
- Maternal illness e.g. sore nipples
- Infant illness → weak suckling and infrequent feeding

➔ *Management*:
- Proper and frequent breast evacuation (starting from day 4: onset of excessive milk secretion), breast engorgement is common between 2- 6 days postpartum.
- Treatment of sore nipples
- Breast pump maybe needed

D. Insufficient breast milk

➔ *Diet:*
Adequate diet and fluid to the mother

➔ *Breast measures*
- Massage breast before and during feeding.
- Hot towels to the breast 3-5 minutes before feeding.

---

9. Mention the different types of milk formulas and their clinical use (2010)

A. Formulas for healthy infants

Type	*Modification*	*Indication (clinical use)*	*Examples*
Humanized formulas (standard)	- modified to very similar to breast milk in composition, quality and calories - fat is replaced with vegetable oils - minerals and vitamins are added - some formulas are fortified with iron	First choice for feeding healthy infants during the first 6 months of life (maternal problem)	- S26 - nan 1 - bebelac 1 - Enfamil 1

B. Formulas for diseased infants

lactose free formulas	**Lactose is replaced usually with sucrose**	- **Lactose intolerance** - **Persistent diarrhea**	- **Bebelac FL** - **S26 FL**
soya based formulas	- Cow milk protein is replaced by soya protein - Not used for routine feeding because of its high aluminum content	Cow's milk allergy	Bebelac soya
Both lactose free and soya based may be present in one formula for patient with persistent diarrhea e.g. Isomil			
elemental formulas (hypoallergic)	- protein is hydrolyzed by enzymes to amino acids and small peptides - fat in the form of medium chain triglycerides - it has bad taste and expensive	- Allergy to both cow milk and soy protein. - Persistent diarrhea - Mal absorption e.g. cystic fibrosis	- Pregestmil - Neocat
preterm infant formulas	- Higher calories: 80 calories / 100 ml - Higher protein - Lower lactose (pre-term has less lactase enzyme) - Vitamins as vitamin E - Minerals (calcium-phosphorus) are added	Preterm infant till reach the desired weight for hospital discharge	Enaflac preterm formula

less commonly used formulas: **phenylalanine free formula in phenylketonuria and salt free formulas in heart failure and renal failure**

10. Define weaning and state a suggested schedule (2007)

➔ *Definition:*

Introduction of food other than milk in the infant s diet.

➔ *Suggested schedule:*

- 4th month: iron fortified cereal mixed with baby s usual milk or water.
- 5th month: vegetable soup – lentils soup.
- 6th month: fruits as apple, pear or mashed banana – mixed vegetables.
- 7th month: egg yolk.
- 8-9th month: can start to share the ordinary foods.
- 9-12th month: most table food is suitable provided soft and in small pieces.

---

11. Describe possible complication of improper weaning practice. (2009)

1. Food allergy
2. Colic and diarrhea
3. Chocking
4. Delayed weaning lead to:
   - under nutrition
   - rickets
   - iron deficiency anemia
   - sticking to breast milk

   "Discuss marasmus, kwashiorkor, rickets & iron deficiency anemia"

---

12. Describe minor problems with feedings

Maternal problems:

A. Nipple soreness

➔ *causes:*

improper attachment to nipple.

➔ *management*:

a. proper positioning and attachment
b. begin nursing on less affected side
c. nursing for shorter periods
d. pumping in severe cases

B. Retracted (flat) nipple

➔ *cause:*

Developmental anomaly

➔ *management*:

Massage & drawing the nipple out before delivery and before feeds

C. Breast engorgement

➔ *causes:*

incomplete breast evacuation due to:

- maternal illness e.g. sore nipples
- infant illness → weak suckling and infrequent feeding

➔ *management*:

- proper and frequent breast evacuation (starting from day 4: onset of excessive milk secretion), breast engorgement is common between 2- 6 days postpartum.
- treatment of sore nipples
- breast pump maybe needed

D. *Insufficient breast milk*

➔ *diet:*
adequate diet and fluid to the mother

➔ *breast measures*

- massage breast before and during feeding.
- hot towels to the breast 3-5 minutes before feeding.

E. *Breast milk jaundice:*

jaundice is more common and prolonged in breast fed infant

I. *Breast milk jaundice:*

- mild form occurring in 3 % of breast fed infants.
- it may be due to maternal hormones present in breast milk that compete with bilirubin levels continue to rise after 4th instead of decreasing may reach 20 mg / dl by 14th day.
- if breast feeding is continued, the level will return very solely to normal by 4-12 weeks.
- stopping breast milk for 2 days leads to rapid fall in serum bilirubin within 48 hours. on continuation of breast milk, bilirubin levels increase slightly.

II. *Breast feeding jaundice:*

- it may be due to inadequate intake of breast milk → increase enterohepatic circulation
- it requires increasing the frequency of nursing.

Infantile problems:

1. Nasal obstruction with crust: saline nasal drops
2. Coanal atresia: cyanosis with feeding
3. Oral fungal infection: difficult feeding
4. Anomalies as cleft lip
5. Weak suckling in premature infants
6. Regurgitation
7. RDS & heart failure

---

13. Give an account on clinical picture and complications of marasmus.

➔ *Definition:*

It is a chronic for of under-nutrition with diminished caloric supply of diet

Incidence: 6 months – 2 years.

➔ *C/P:*

1. *Growth failure and growth retardation: that could be of:*

- 1st degree: weight loss 15-25%
- 2nd degree: weight loss 25-35%
- 3rd degree: weight loss more than 35%

2. Muscle wasting:

- Assessed using mid-arm circumference.
- Normally it's above 15 cm.
- In a marasmic case it is usually below 12 cm indicating severe muscle wasting.
- Usually there is abdominal distension due to abdominal muscle wasting causing protrusion of abdominal content.

3. *Loss of subcutaneous fat:*

Measured by using skin fold thickness over triceps.

- 1st degree: abdominal wall.
- 2nd degree: buttocks and thighs
- 3rd degree: generalized and involve face giving senile appearance.

4. *Psychological affection:*

- Anxious look.
- Continuous crying.
- Good appetite.

➔ *Complications:*

1. Chronic diarrhea.
2. Starvation diarrhea in which mucosa is digested by pancreatic juice giving greenish diarrhea.
3. Recurrent infection (Chest-UTI).
4. Mineral deficiency in the form of iron deficiency anemia.
5. Vitamins deficiency in the form of:
   - Vit A: Keratomalacia, keratosis and xerophthalmia.
   - Vit D: Rickets.
   - Vit K: Bleeding tendency.
   - Vit C: Scurvy.
   - Vit B1 (Thiamin): Beri Beri (Ataxia, Retardation and Heart failure)
   - Vit B3 (Niacin): Pellagra (Dermatitis, Dementia and Diarrhea)
6. Death which may be due to:
   Dehydration, Hypothermia, Electrolyte imbalance or Hypoglycemia.

---

14. Etiology and management of marasmus.

➔ *Etiology:*

1. *Nutritional causes:*
   a. Scanty breast milk.
   b. Over-diluted, small amount or infrequent formula feeding.
   c. Precipitating factors:
      – Loss of nutritional elements (vomiting & diarrhea).
      – Prolonged dietary restriction (wrong therapeutic measure).
2. *Non nutritional causes:*

a. Chronic infections:
   – Tuberculosis.
   – Chronic diarrhea.
   – UTI.

b. Chronic illness:
    - GIT anomalies:
        - Cleft palate.
        - Congenital hypertrophic pyloric stenosis.
        - Corrosive esophageal stricture.
    - Malabsorption:
        - Cystic fibrosis.
        - Celiac disease.
    - Systemic disease:
        - Congenital heart disease and heart failure.
        - Urinary tract anomalies.
        - Renal tubular acidosis and renal failure.
        - Liver cell failure.
        - Cerebral palsy.
        - Diabetes.

➔ *Management:*

Investigations:

Diagnosis is mainly clinical, investigations are to identify cause and complications

- Cause: اكتب ما يفتح الله عليك
- Complications:
- CBC, CRP, ESR, urine and stool analysis, Ca phosphate, ALP

1. *Hospital management:*

Indications:

a. 3rd degree marasmus.
b. Marasmus with severe infection (pneumonia, infection, sepsis).
c. Marasmic kwashiorkor (edema).

Management of complications:

a. Correction of shock & dehydration (IV fluids).
b. Correction of anemia (blood or packed red blood cells).
c. Correction of hypothermia (adequate clothing or radiant warmer).
d. Treatment of infection (antibiotics).
e. Correction of hypoglycemia.

2. *Home or hospital (nutritional) management:*

Diet:

a. Milk in young non weaned infants.
b. Other food (balanced diet) in older weaned infants.

Amount:

150 kcal/kg/day.

Method:

Orally: start by small tolerable amount (calculate according to actual weight) and gradually increase the amount.

3. *Supportive measures:*
    a. Vitamin A, single dose:

- 50.000 IU up to 6 months of age.
- 100.000 IU from 6 months to 1 year.
- 200.000 IU if more than 1 year.

b. Vitamin B-C-D-E complex.
c. Folic acid.
d. Iron (4-6 mg/kg/day in 3 doses).
e. Zinc and other trace elements.
f. Treat the cause (e.g. parasitic infestation).

---

14. Discuss etiology and clinical picture of Kwashiorkor.

➔ *Definition:*

It's a severe form of malnutrition due to protein deficiency with adequate caloric intake (High CHO)

Incidence: 1.5 – 2 years (time of weaning).

➔ *Etiology:*

1. **Dietetic error**:
   Replace milk intake as a part of weaning process b high carbohydrate low protein diet.
2. **Precipitating factors**: Gastroenteritis and measles.
3. **Maternal deprivation**: As in birth of another baby.

➔ *C/P:*

A. Constant manifestations:

1. Pitting edema:
   - The most essential feature.
   - Starts in the dorsum of feet then progress to both lower limbs then to back of hands → cheeks → generalized, but with no ascites.
2. Growth failure:
   - Failure of weight gain.
   - Bod weight is 60-80% masked by edema and subcutaneous fat.
3. Decreased muscle/fat ratio:
   - Muscle atrophy due to marked protein depletion.
   - Excess fat due to high CHO intake.
   - It can be assessed by skin fold thickness.
   - Arm circumference could be normal, but mostly fat.
4. Mental changes:
   - Apathy- Disinterest and Lethargy.
   - As amino acids are used in the formation of mood hormones (disturbed amino acid metabolism, niacin deficiency & maternal deprivation).

B. Variable manifestations:

1. Skin changes:
   - Fissures, Ulceration, Hypo and Hyperpigmentation in the buttocks, back of thighs, inguinal region and axilla.
   - It is due to decreased amino acids, Vitamin A, Zink and nicotinic acid.
2. Hair changes:
   - Sparse, easily detached, light in color with flag sign" of different colors and moves

with air currents like a flag"

- It is due to decreased amino acids, Copper and Melanin.

3. Hepatomegaly: Fatty infiltration
   - Soft and smooth.
   - Due to excess triglycerides due to increased CHO and decreased lipotropic factors due to decreased protein intake.
   - As proteins in the form of lipotropic factors transport lipids from liver to adipose tissue in the form of lipoproteins, so in the absence of protein lipids accumulate in the liver causing fatty liver hence hepatomegaly.
4. GIT manifestations:
   - Anorexia, Vomiting and Diarrhea.
   - Due to infection, enzymatic deficiency and villous atrophy.
   - these factors cause prolonged presence of food in the lumen with more fermentation by bacteria → favors infection.

---

15. Discuss complications and management of a case of kwashiorkor.

➔ *Complications:*

1. Chronic diarrhea.
2. Recurrent infection (Chest-UTI).
3. Sepsis.
4. Mineral deficiency in the form of iron deficiency anemia.
5. Vitamins deficiency in the form of:

- Vit A: Keratomalacia, keratosis and xerophthalmia.
- Vit D: Rickets.
- Vit K: Bleeding tendency.
- Vit C: Scurvy.
- Vit B1 (Thiamin): Beri Beri (Ataxia, Retardation and Heart failure)
- Vit B3 (Niacin): Pellagra (Dermatitis, Dementia and Diarrhea)

6. Death which may be due to:
   Dehydration, Hypothermia, Electrolyte imbalance or Hypoglycemia.

➔ *Management:*

A. Investigations:

1. Plasma proteins: normally (6-8 gm%)
   - Low total proteins.
   - Low serum albumin.
   - Low serum alpha and beta globulins with increased gamma globulins, indicating the presence of infection, but this increase is not enough to fight infection as there are many factors favoring the infection (decreased cell mediated immunity, defects in the barriers " skin" and edema which is a good medium for bacteria).
2. Blood glucose:
   - Hypoglycemia due to impaired glycogenolysis.
   - Fasting hypoglycemia causing hypothermia.
3. Electrolytes:
   - Decreased K, Na and Mg concentration, but with increase in total body Na.

- This is due to increased Aldosterone (1 Na + 1 water retention) and ADH (0 Na + 1 water retention) so the result is (1 Na + 2 water).
- This means increase total Na, but decreased concentration giving what so called dilutional hyponatremia.

4. CBC: Anemia and leukocytosis.

B. Treatment:

1. Hospital admission for:

Any case of kwashiorkor (edema):

- *Management of complications as follows:*
  a. Correction of **shock and dehydration**: IV fluids.
  b. Correction of **anemia:** Blood or packed RBCs.
  c. Correction of **hypothermia**: adequate clothing or radiant warming.
  d. Treatment of **infection:** Antibodies.

2. Home or hospital nutritional management:

- Diet:
  - **Milk:** Start with Soy based lactose-free milk then gradually shift to standard formulas.
  - **Animal protein** (High biological value): Eggs, chicken, meat and yogurt.
  - **Plant protein:** Mixture of lentils, beans and bees. (Mixed to include all essential amino acids)
- Amount: **4-6** gm/kg/day
- Method: Start orally.
  - If there is marked anorexia, then through nasogastric tube.
  - In severe cases: parenteral feeding is required (TPN "Total parenteral nutrition").

3. Supportive measures:

- Vit A: Single dose:
  - 50,000 IU up to 6 months.
  - 100,000 IU from 6 months to one year.
  - 200,000 IU more than one year.
- Vit B-C-D-E complex.
- Folic acid, Iron (4-6 mg/kg/day in 3 doses.)

4. treatment of the cause: treatment of parasitic infestation if present.

N.B: Sequence of improvement is as follow:
- ↑ Mood → ↑ Appetite → ↓ Edema → ↑ Weight

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16. Etiology of Rickets.

Nutritional and non-nutritional

A. Nutritional: "very similar to iron deficiency anemia"

1. **Rachitogenic diet** (poor in Vit D & interfere with Ca+2 absorption)
   a. prolonged exclusive breast-feeding into late infancy (most common cause)
   b. depending on animal milk "cow milk"
   c. No optimum Ca^{+2}/phosphorus ratio as in cow milk "high phosphorus"
2. **Lack of exposure to the sun**

Living in northern latitudes-Dark skinned people over wrapping of babies

3. **Maternal Vit D deficiency**
4. **preterm baby**

B. Non-nutritional:

1. **Renal**
   - **Renal osteodystrophy** in chronic renal failure due to
     - phosphorus retention & decrease serum Ca^{+2}
     - failure of Vit D activation (decrease activity of 1 alpha hydroxylase)
   - **Renal tubular rickets**
     - Vit D resistant hypophosphatemic Rickets: decrease Ph reabsorption
     - Vit D resistant hypocalcemic Rickets: decrease Ca^{+2} reabsorption
     - Renal tubular acidosis increases HCO3 excretion → decrease Ca++2 reabsorption
     - Fanconi syndrome **Ph**osphaturia – **A**minoaciduria – **G**lucosuria
     - Cystinosis
2. **Hepatic:** chronic liver disease → defective activation of Vit D & defective absorption of Vit D (fat soluble)
3. **Malabsorption** – cystic fibrosis – celiac disease
4. **Congenital hypophosphatase … hyper parathyroidism**

N.B. Treatment of non nutritional rickets:

1. Vitamin D dependent rickets: active form of vitamin D (0.1 microgram/kg/day).
2. Vitamin D resistant hypophosphatemic rickets: oral phosphate (0.5 g/day).
3. Vitamin D resistant hypocalcemic rickets: oral calcium.

---

17. Mention 4 types of Renal tubular rickets. "2001"

1. Vit D Resistant hypophosphatemic rickets
2. Vit D Resistant hypocalcemic rickets
3. Renal tubular acidosis "increased HCO3 excretion"
4. Fanconi syndrome phosphaturia – aminoaciduria – glucosuria
5. Cystinosis

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18. Vit D Deficiency Rickets "Nutritional Rickets"

1. **Rachitogenic diet** (poor in Vit D & interfere with Ca+2 absorption)
   d. prolonged exclusive breast-feeding into late infancy (most common cause)
   e. depending on animal milk "cow milk"
   f. No optimum Ca^{+2}/phosphorus ratio as in cow milk "high phosphorus"
2. **lack of exposure to the sun**

Living in northern latitudes-Dark skinned people over wrapping of babies

3. **Maternal Vit D deficiency**
4. **preterm baby**

---

19. Hypervitaminosis D. "99/2001"

➔ *Cause:*

Prolonged intake of Vit D more than 2000 IU

➔ *C/P:*

1. GIT: Anorexia –vomiting –constipation
2. Kidney: Polyuria - Polydipsia –nephrocalcinosis→RF
3. General: malaise and lassitude
4. Metastatic calcification may occur

➔ *Investigations:*

Hypercalcinemia above 13 mg %

➔ *TTT:*

stop Vit D & ca^{+2} intake - Corticosteroids in severe cases as it decreases ca^{+2} absorption

---

20. List the causes, mechanism and pathogenesis of Rickets.

Nutritional and non-nutritional

A. Nutritional:

1. **Rachitogenic diet** (poor in Vit D & interfere with Ca+2 absorption)
   a. prolonged exclusive breast-feeding into late infancy (most common cause)
   b. depending on animal milk "cow milk"
   c. No optimum Ca^{+2}/phosphorus ratio as in cow milk "high phosphorus"
2. **Lack of exposure to the sun**
   Living in northern latitudes-Dark skinned people over wrapping of babies
3. **Maternal Vit D deficiency**
4. **preterm baby**

B. Non-nutritional:

1. **Renal**
   - **Renal osteodystrophy** in chronic renal failure due to
     - phosphorus retention & decrease serum Ca^{+2}
     - failure of Vit D activation (decrease activity of 1 alpha hydroxylase)
   - **Renal tubular rickets**
     - Vit D resistant hypophosphatemic Rickets: decrease Ph reabsorption
     - Vit D resistant hypocalcemic Rickets: decrease Ca^{+2} reabsorption
     - Renal tubular acidosis increases HCO3 excretion → decrease Ca++2 reabsorption
     - Fanconi syndrome **Ph**osphaturia – **A**minoaciduria – **G**lucosuria
     - Cystinosis
2. **Hepatic:** chronic liver disease → defective activation of Vit D & defective absorption of Vit D (fat soluble)
3. **Malabsorption** – cystic fibrosis – celiac disease
4. **Congenital hypophosphatase**
5. **Hyperparathyroidism**:
   - increased parathyroid hormone – Ca^{+2} resorption from bone to blood

- Congenital absence of alkaline phosphate **(**Defective mineralization of bone)

➔ *Mechanism:*

- Epiphysis: failure of Ca^{+2}/Ph^{+2} crystal deposition In the cartilage cells leading to excess cartilage cells Proliferation &invasion of metaphysis (broadening +fraying)
- Diaphysis: decrease growth of mineral ca^{+2}
  Bone refraction & fracture

---

21. Clinical picture, investigations & management of rickets.

Clinical picture:

1. *Skeletal manifestations:*
   - **i. <u>Head:</u>**
     a. Craniotabes (behind the ear, **1st sign** to appear).
     b. Delayed closure of anterior fontanel.
     c. Bossing at frontal and parietal eminences (square vault = **caput quadratum**).
     d. Enlarged head circumference.
     e. Delayed dentition.
   - **ii. <u>Upper limb:</u>**
     a. Convex deformity of radius and ulna (in **crawling** infant).
     b. Broad lower ends of radius and ulna.
     c. Fractures.
   - **iii. <u>Lower limb:</u>**
     a. Deformity in **walking** infant.
     b. Broad lower ends of tibia and fibula.
     c. **Genu verum (bow legs)** or **knock knees (genu valgum).**
     d. **Marfan sign**: groove over medial malleolus.
   - **iv. <u>Thorax:</u>**
     a. Rosary beads: broadening at costochondral junctions.
     b. Harrison sulcus: horizontal groove along lower part of the chest (costal insertion of diaphragm).
     c. Flaring of lower ribs.
     d. Longitudinal sulcus: at sides of the thorax behind rosary beads.
     e. Pigeon chest: protrusion of the sternum.
   - **v. <u>Spine:</u>**
     Dorsolumbar kyphosis when sitting, lordosis when standing.
2. *Muscles and ligaments:*
   <u>Generalized hypotonia and laxity of ligaments (dt. hypophosphatemia):</u>
   a. Delayed motor milestones: sitting, standing & walking.
   b. Kyphosis or scoliosis.
   c. Distention of the abdomen with ptosis of liver and spleen.
3. *Neurological manifestations:*
   a. Restlessness and sweating.
   b. Tetany in severe hypocalcemia (see later).

Complications:

1. *Respiratory infections and atelectasis due to:*

a. Chest deformities that interfere with proper expansion.
b. Hypotonia of respiratory muscles with weak cough reflex.

2. *Neurological:*
   Tetany and convulsions.
3. *Iron deficiency anemia:*
   Because breast milk is deficient in both iron and vitamin D (association, not complication).
4. *Pathological fractures (green-stick fractures).*
5. *Constipation.*

Investigations:

1. *Laboratory:*
   a. **Serum calcium:**
      Normal (9-11 mg%) or Mild reduction (severe cases with calcium depletion or parathyroid exhaustion or shock therapy with vitamin D due to rapid mobilization of calcium to growing bone).
   b. **Serum phosphate:**
      Markedly decreased (normal level is 4.5-6.5 mg%).
   c. **Serum alkaline phosphatase:**
      - High.
      - Earliest manifestation.
2. *Radiological (X-ray of wrist or ankle):*
   a. **Active rickets:**
      - Epiphysis:
        Wide joint space (wide epiphysis) (translucent non calcified area).
      - Epiphyseal line:
        Fraying, cupping & widening.
      - Shaft:
        - Generalized rarefaction of bone.
        - Pathological green stick fractures.
        - Deformities.

   b. **Healing rickets (2-3 weeks of vitamin D therapy):**
      - Concave dense transverse line at lower ends of long bones.
      - Denotes mineralization in the **zone of preparatory calcification.**

   c. **Healed rickets (several weeks of vitamin D therapy):**
      - Thick dense transverse line.
      - Bone density improves.
      - Osteoid tissue is calcified and united with the shaft.
      - Deformities **may persist.**

Prevention:

1. Oral vitamin D, daily, from 2nd month of life:
   - Full-term: 400 IU since birth.
   - Preterm: 800 IU from the age of 1 month.
2. Exposure to sun.
3. Diet rich in vitamin D as egg yolk, liver & oily fish.

Treatment:

1. Vitamin D therapy:

a. Oral treatment daily for 2-4 weeks:

- Cholecalciferol (vitamin D_3): 2000-5000 IU/day.
- 1, 25 hydroxycholecalciferol: 0.5-2 microgram/day.

B. IM injection (single dose): 600.000 IU.

2. Instructions to the parents:

a. Diet rich in vitamin D.

b. Adequate sun exposure.

Treatment of complications:

1. Treatment of iron deficiency anemia (see hematology).
2. Treatment of associated infections.
3. Treatment of tetany by IV calcium gluconate 10% slowly IV (1 ml/kg).

OTHER TOPICS:

1. Comparison between colostrum and mature human milk.

	Colostrum	*Mature milk*
Timing	1st 3 days	After 2 weeks
Amount	40-60 ml/day	1-2 L/day
pH/specific gravity	Alkaline/1040-1060	Acidic/1020-1040
Color	Yellow	White
Calories	57 kcal/dl	67 kcal/dl
Consistency	Thick	Thin
CHO	5.5 gm/dl	7 gm/dl
Protein	8 (mainly lactalbumin)	1.2
Fat	3	3.5
Minerals	4	0.25
Vitamins	Higher fat soluble vitamins	Higher water soluble vitamins

2. Technique of breast feeding.

1. *Positioning: (Elevate/Rotate/Support/Make the neck straight)*
   a. Elevation of the infant to the height of the breast.
   b. Rotating the infant's body completely to face the mother.
   c. Supporting the whole body of the infant (not just the neck).
   d. The neck should be straight or slightly extended.
2. *Attachment to the breast: (Touch/Wait/Move)*
   a. The mother touches her infant's lips with her nipple.
   b. Wait until her infant's mouth is wide open.
   c. Move her infant quickly to her breast.

Signs of good attachment	*Signs of poor attachment*	*Signs of effective suckling and swallowing*
- Wide open mouth - Chin very close to breast - Lower lip turned outwards - Nose away from breast	- Mouth not open well - Chin is away - Most areola is exposed	- Slow and deep sucks - Swallowing is seen or even heard

3. *Termination:*

When the infant releases the nipple and seems relaxed and sleepy.

3. Program of breast feeding.

- Start in the 1st day or hours after birth.
- On demand feeding in 1st 4 months.
- Average 8-10 feeds/day.
- Frequency: not more than 3 hours/daytime and 5 hours/night time.
- Avoid scheduled feeding and bottle feeding.

- Exclusive breast milk for 4-6 months.

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4. Fetal problems that interferes with breast feeding.

1. Nasal obstruction with crusts (saline nasal drops).
2. Oral fungal infection with difficult feeding.
3. Choanal atresia with cyanosis during feeding.
4. Anomalies as cleft lip and palate.
5. Weak suckling in premature infants.
6. Regurgitation (very common, mild cases just need reassurance).
7. RDS & heart failure.

---

5. Safe and harmful drugs during lactation.

Safe	*Harmful*
1. Most antibiotics esp. penicillin, cephalosporin and erythromycin. 2. Most analgesics in small dose esp. aspirin, paracetamol and ibuprofen. 3. Vitamin B & C. 4. Insulin & small doses of steroids. 5. Sedatives and antihistaminics in SD.	1. Tetracyclines and chloramphenicol. 2. Ergot preparations and indomethacin. 3. Vitamin A & D in large doses. 4. Iodides and estrogen. 5. Sedatives and antihistaminics in LD.

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6. Contraindications of breast feeding.

1. *Maternal:*
   a. Debilitating chronic disease:

As liver cell failure, decompensated rheumatic heart, ..

   b. Active maternal CMV infection or open TB (HIV & HBV are not absolute contraindications).
   c. Local breast causes:

As cancer breast and TB.

   d. Insane mother and substance abuse.
   e. Absent breast milk secretion.
2. *Infant:*
   a. Lactose intolerance:

   Etiology:

   Lactase deficiency leading to accumulated lactose in intestine with bacterial fermentation.

   C/P:

   a. Abdominal distension.
   b. Colic.
   c. Osmotic diarrhea with frothing.

   Diagnosis:

   a. Reducing substance in stool.
   b. Low stool pH (lactose gives lactic acid).

Treatment:

Lactose free formula.

b. Galactosemia:

Autosomal recessive disorder.

Etiology:

Reduced G1PUT that transforms galactose to glucose, leading to accumulation of galactose-1-phosphate and:

- Hypoglycemia, neonatal convulsions & MR.
- Chronic active hepatitis & cirrhosis.
- Cataract.

Diagnosis:

a. Reducing substance in urine (galactose).
b. Enzyme assay.

Treatment:

Lactose free formula.

c. Phenylketonuria:

Autosomal recessive disorder.

Etiology:

Reduced phenylalanine hydroxylase that transforms phenylalanine to tyrosine.

C/P:

a. Fair skin, hair color & blue eyes.
b. Convulsions & MR.
c. Hepatomegaly & cirrhosis.

Diagnosis:

a. Screening tests (TMS).
b. Confirmatory test:

Increased blood phenylalanine (> 20 mg/dl).

Treatment:

Phenylalanine free milk.

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7. Infantile tetany.

Etiology:

1. Hypocalcemia.
2. Alkalosis.
3. Hypomagnesemia.

Causes of tetany in rickets:

1. Severe vitamin-D deficiency rickets.
2. Calcium consumption in bone.
3. Shock therapy with vitamin D.

Clinical picture:

1. Latent tetany: (serum calcium 7-9 mg/dl; needs provocation test)

- Chvostek sign (tapping facial nerve leads to contraction of orbicularis oris).
- Trousseau sign (occluding the arterial flow to forearm leads to carpal spasm).

- Peroneal sign (tapping peroneal nerve leads to dorsiflexion of foot).

2. Manifest tetany: (serum calcium < 7 mg/dl)

- Carpopedal spasm.
- Laryngeal spasm (stridor & airway obstruction).
- Generalized convulsions.

Treatment:

1. Immediate: calcium gluconate 10% 10 cc slowly IV.
2. Maintenance: diet rich in calcium, oral vitamin D supplements.

IMPORTANT NOTES:

1- Bifidus factor → oligo saccharides that favors growth of lactobacillus Bifidus which secretes acids, inhibits growth of bacteria (E-coli) and reduce incidence of diarrhea

2- Breast feeding jaundice	3- Breast milk jaundice
Decrease intake of milk → increase enterohepatic circulation	Reduced hepatic conjugation of bilirubin

4- Caput quadratum → bossing of frontal & parietal eminencies (rickets)

5- Craniotabes → 1st sign to appear in rickets (behind ear)

6- Marfan sign → groove over medial malleolus

7- Harrison sulcus → horizontal groove along lower part of chest

8- Frayed cupping → epiphyseal line concavity in active rickets

9- Fanconi syndrome → phosphaturia, glucosuria, aminoaciduria

10- Chovestek sign → tapping of facial nerve leads to contraction of orbicularis oris (latent tetany)

11- Trousseau sign → occluding arterial flow to forearm leads to carpal spasm (latent tetany)

12- Peroneal sign → tapping the peroneal nerve leads to dorsi flexion of foot (latent tetany)

Genetics

ESSAY QUESTIONS:

1. Mention the classification of genetic disorders and the clinical situations suspecting chromosomal abnormalities.

➔ *Classification of genetic disorders:*

1. Single gene disorders:

a. Autosomal dominant inheritance.
b. Autosomal recessive inheritance.
c. X-linked inheritance (dominant or recessive).

N.B.

Recessive → 2 copies of the abnormal gene are present.

Dominant → 1 copy of the abnormal gene is present.

2. Multifactorial (polygenic) inheritance:

- Inheritance that results from interaction between genetic and environmental factors.
- Examples: congenital heart disease, pyloric stenosis and cleft palate.

3. Mitochondrial inheritance:

- Inheritance through mitochondrial DNA (maternally-inherited).
- Examples: mitochondrial encephalopathy and cardiomyopathy.

4. Chromosomal abnormalities:

- In autosomes or in sex chromosomes.
- Structural or numerical.

➔ *Clinical situations suspecting chromosomal abnormalities (= karyotyping indications):*

1. Abnormal features:

a. Face:

Odd face as:

- Mongoloid look of down syndrome **(discuss, see later)**
- Coarse features.

b. Eyes:

Mongoloid or antimongoloid slant.

c. Ears:

Malformed or mal-seated ear.

d. Mouth and mandible:

- Cleft lip and palate.
- Micrognathia (receding mandible).

e. Hands and feet:

- Syndactyly (fused fingers).
- Polydactyly (extra finger).
- Clinodactyly (incurved little finger).
- Simian crease (single transverse palmar crease).

2. *Delayed puberty:*
   Klinefelter (males) and Turner syndrome (females).

N.B. Short stature in females → karyotyping. **(Give reason question)**

3. *Mental retardation.*
4. *Ambiguous genitalia.*
5. *Spontaneous abortion (7% chromosomal abnormalities).*

N.B. Karyotyping: study of number, size and shape of chromosomes in a single human cell.

---

2. What are the structural chromosomal abnormalities of genetic disorders.

1. *Translocation:*
   Transfer of genetic material from one chromosome to another.
   A. *Reciprocal translocation:*
      Exchange of genetic material between 2 different chromosomes.
      a. **Balanced:**
         Exchange involves no loss or gain of chromosomal material → no effect.
      b. **Unbalanced:**
         Exchange results in unequal amount of chromosomal material → dysmorphic features.
   B. *Robertsonian translocation:*
      - The whole chromosome is translocated to another.
      - Example: Down syndrome (translocation type).
2. *Deletion:*
   - Loss of a portion of chromosome, mostly through breakage.
   - Example:
     a. Deletion of a part of chromosome 15 → Prader-Willi syndrome (hypotonia, obesity and hypogonadism).
     b. Deletion of tip of short arm of chromosome 5 → Cri-du-chat syndrome.
3. *Ring chromosome:*
   A special deletion, in which the broken ends reunite forming a ring.
4. *Inversion:*
   Fragmentation of a chromosome, then reconstitution in an inverted manner.
5. *Duplication:*
   Presence of an extra piece of a chromosome.
6. *Isochromosome:*
   During cell division, the centromere divides **transversely** instead of longitudinally.
7. *Fragile chromosomes:*
   Example (Fragile X chromosome):
   In male presents with:
   - Mental retardation.
   - Face:
     – Prominent forehead, mandible and ear.
     – Long face.
   - Large testes.

3. Describe genetic types (cytogenetics) of down syndrome.

➔ *Definition:*

- Down syndrome = trisomy 21 = mongolism.
- A genetic disorder caused by the presence of all or part of a third copy of chromosome 21.
- Typically associated with delayed physical growth, characteristic facial features and mild to moderate intellectual disability.

➔ *Incidence:*

- Most common autosomal trisomy.
- 1/700
- Incidence of non-disjunction type increases with advanced maternal age:
  - 1/2000 at 20 years.
  - 1/1000 at 30 years.
  - 1/100 at 40 years.
  - 1/10 at 50 years.

➔ *Genetic types:*

	Non-disjunction	*Translocation*	*Mosaic*
Incidence	94%	5%	1%
Number of chromosomes	47	46 (with large abnormal chromosome)	Some cells 46 Other cells 47
Mechanism	- Non-disjunction during **maternal meiosis.** - The pair of chromosome number 21 fail to disjoin → gamete with 24 chromosomes → fertilized by normal gamete (23 chromosomes) → zygote with 47 chromosomes (3 chromosomes are 21).	- The extra chromosome number 21 is not present separately, but it is translocated to one of the chromosomes of: **D group** (13, 14, 15) "commonly 14" → D/G trisomy. **G group** (21, 22) → G/G trisomy.	- After fertilization and normal zygote formation, non-disjunction occurs in early **mitosis.** - This results in 2 cell lines (one with 46 chromosomes, and the other with 47 chromosomes). - **Mild** mental retardation and other features.
Risk factor	Advanced maternal age.	Familial.	**Not** dependent on maternal age or family history.
Risk of recurrence	1/2000 at 20 years. 1/1000 at 30 years. 1/100 at 40 years. 1/10 at 50 years.	**D/G trisomy:** 1/3 normal. 1/3 carrier. 1/3 down syndrome. **G/G trisomy:** 100% down syndrome.	

➔ *Clinical picture:*

A. Abnormal features:

1. Head and neck:

a. Vault:

- Thin silky hair.
- Small head.
- Flat occiput (brachycephaly).

- Delayed closure of anterior fontanel.

b. <u>Eyes:</u>

- Upward slanting palpebral fissure.
- Medial epicanthal folds.
- Brush-field spots (white spots on iris).
- Apparent strabismus.

c. <u>Nose:</u>

Flat nasal bridge.

d. <u>Ear:</u>

- Low seated small ears.
- Over-folded helix.
- Underdeveloped ear lobule.

e. <u>Mouth:</u>

- Delayed teething.
- Protruded fissured tongue (scrotal tongue).
- Small mandible.

f. <u>Neck:</u>

Short and broad.

2. *Trunk:*
   a. Hernia.
   b. Broad iliac bones.
   c. Abdominal distension.
3. *Genitalia:*
   a. Small penis.
   b. Undescended testis.
4. *Hands:*
   a. Short and broad.
   b. Simian crease (single transverse palmar crease).
   c. Clinodactyly (incurved little finger).
5. *Feet:*
   a. Short and broad.
   b. Longitudinal plantar crease.
   c. Big space between 1st and 2nd toes (sandal sign).

B. *Physical, motor and mental retardation:*

1. *Delayed physical growth:*
   a. Underweight.
   b. Short stature.
   c. Microcephaly.
2. *Delayed motor development:*
   Sitting, standing, walking, ...
3. *Delayed mental development:*
   Social smile, speech, mother recognition, ...

C. *Congenital anomalies:*

1. *Cardiovascular system:*

   Congenital heart disease (40% of cases):

   - Endocardial cushion defect.
   - VSD.
   - Fallot tetralogy.

2. *Respiratory system:*

   Recurrent chest infections.

3. *CNS:*

   a. Generalized hypotonia and laxity of ligaments (acrobatic maneuver).
   b. Epilepsy.

4. GIT:

   a. Imperforate anus.
   b. Duodenal atresia.
   c. Hirsch-sprung disease.

5. *Kidneys:*

   Renal anomalies (detected by US).

6. *Endocrine system:*

   High incidence of diabetes and hypothyroidism.

7. *Higher incidence of hearing and visual impairment.*

➔ *Complications:*

1. Higher susceptibility for infections, esp. recurrent chest infections.
2. Heart failure (cause of death in infancy).
3. Higher incidence of leukemia.
4. Accidents.

➔ *Prognosis:*

- In absence of congenital heart diseases or leukemia → normal survival (while other trisomies die in infancy).
- Usually happy and love music.
- Decreased fertility and libido (but female down may have a child 50% down).

➔ *Investigations:*

1. *Prenatal diagnosis:*

   a. Triple test:

   - Low alpha fetoprotein.
   - Low estradiol.
   - High hCG.

   b. Ultrasonography:

   Increased thickness of nuchal fold.

   c. Amniocentesis or chorionic villous sampling for karyotyping.

2. *Karyotyping (chromosomal study):*

   a. For the infant to:

   - Confirm the diagnosis.
   - Detect the genetic type.

b. <u>For the parents:</u>

Only in **translocation** type; to detect recurrence risk.

3. *Investigations for complications:*
   a. CBC (leukemia).
   b. Thyroid hormones.
   c. Blood glucose.
   d. Chest x-ray (pneumonia).
   e. Abdomen x-ray (duodenal atresia).
   f. Echo (cardiac anomalies).
   g. Abdominal ultrasound (renal & GIT anomalies).
   h. Hearing and vision testing regularly.

➔ *Management:*

1. Proper nutrition.
2. Diagnosis and management of complications as heart failure and chest infection.
3. Educational and social rehabilitation in special institutes + speech therapy (to make the child as independent as possible).

➔ *Prevention:*

Genetic counseling.

---

4. Autosomal recessive inheritance (and mention 5 examples).

List features of autosomal dominant inheritance. Give 3 examples.

Define autosomal dominant inheritance, describe its characteristic features and give 5 examples to diseases inherited by this way.

	Autosomal dominant inheritance (AD)	**Autosomal recessive inheritance (AR)**
Definition	- Appears even if a **single copy** of the abnormal gene is located on one of the autosomes. - Over 3000 disorder identified.	- Appears only if **2 copies** of the abnormal gene are located on 2 of the autosomes. - Over 1500 disorder identified.
Affected individuals	- **Homozygous** → 2 copies (more severe symptoms or fatal). - **Heterozygous** → only 1 copy.	**Only homozygous** (2 abnormal genes, one from each parent).
Unaffected individuals	Normal (no carrier state).	Normal or carriers (heterozygous).
Recurrence risk	- Heterozygous: 50%. - Homozygous: 100%.	When parents have one affected child, risk to each subsequent offspring is 25%.
Distribution	Equal between males and females.	
Consanguinity	No relation.	Strong relation.
Diseases	Usually structural defect.	Usually enzymatic defect.

Examples	**<u>Hematology:</u>** - Hereditary spherocytosis. - Von-Willebrand disease. **<u>Skeletal disorders:</u>** - Achondroplasia. - Osteogenesis imperfecta. - Ehlar-Danlos syndrome. - Marfan syndrome. - Otosclerosis. **<u>Renal:</u>** AD polycystic kidney. **<u>Neurology:</u>** - Tuberous sclerosis. - Neurofibromatosis. - Huntington's disease. - Myotonic dystrophy.	**<u>Hematology:</u>** - Thalassemia. - Sickle cell anemia. **<u>Endocrine:</u>** - Adreno-genital syndrome. - Goitrous cretinism. **<u>Metabolic:</u>** - Phenylketonuria. - Cystic fibrosis. - Galactosemia. - Glycogen storage disease. - Alpha 1 anti-trypsin deficiency. **<u>Neurology:</u>** Werdnig-Hoffmann disease.

<u>N.B.:</u>

- Most humans carry at least one autosomal recessive gene → so, married relatives may carry the same abnormal gene.
- Some carriers of AR diseases are <u>biologically fitter</u> than normal (sickle cell carrier is resistant to infection with malaria).

---

5. Define sex-linked recessive inheritance, describe its characteristic features and give 5 examples to diseases inherited by this way.

X-linked recessive inheritance:

➔ *Definition:*

Alteration in one gene on the X chromosome causes the condition in males but not usually when females have one copy of the altered gene.

1. *Females:*

<u>Affected if:</u>

a. Inherited 2 copies of the abnormal gene.
b. Has Turner syndrome (45, XO).
c. Lionization.

<u>Recurrence:</u>

- <u>Carrier female transmits the abnormal gene to:</u>
  - **50%** for each **son** to be **affected.**
  - **50%** of her **daughters** to be **carriers**.
- This transmission is called **vertical** or **knight pattern** of inheritance.
- Carrier female may show very mild symptoms or abnormal lab findings.

2. *Males:*

- Affected from carrier or affected mother only (not from father).
- No carrier state.

Recurrence:

Affected male will transmit the abnormal gene to **all of his daughters** (will be **carriers**) and to **none of his sons**.

➔ *Examples:*

1. Agammaglobulinemia.
2. Blood diseases:
   a. G6PD deficiency.
   b. Hemophilia A & B.
3. Color blindness (green-red).
4. Duchenne muscular dystrophy and Becker's muscular dystrophy.
5. Errors of metabolism:

Mucopolysaccharidosis (MPS) II (Hunter syndrome).

N.B.

Y-linked inheritance:

- Y chromosome carries genes that determine sexual differentiation and spermatogenesis.
- If affected, it leads to infertility.
- Genes on Y chromosome show **holandric inheritance** (passed exclusively from an affected man to all his sons and to none of his daughters).

---

6. State features and give examples of multifactorial (polygenic) inheritance.

➔ *Definition:*

- Interaction of a **genetic** predisposition with adverse **environmental** factors (multifactorial).
- Genetic susceptibility is determined by effect of **many genes** (polygenic).

➔ *Characteristic features:*

- Much **commoner** than single gene disorders.
- Prevalence is 2-5% (maybe more in some diseases).
- Risk declines sharply with more distant relationship with the affected individual.
- Risk increases with more than one affected individual in the family or affected person of the less risky sex.

➔ *Examples:*

1. *Congenital malformations of infancy:*
   a. Cleft lip/palate.
   b. Pyloric stenosis.
   c. Congenital heart disease.
   d. Congenital dislocation of the hip.
   e. Neural tube defects (spina bifida – anencephaly).
   f. Talipes equinovarus.
   g. Hypospadias.
2. *Acquired disorders of childhood:*
   a. Atopy and bronchial asthma.
   b. Type I diabetes mellitus.
   c. Epilepsy.
3. *Acquired disorders of adulthood:*
   a. Diabetes mellitus (type I and II).

b. Alzheimer's disease.
c. Hypertension.
d. Atherosclerosis and coronary heart disease.

4. *Normal criteria:*
   a. Height.
   b. Intelligence.

OTHER TOPICS:

1. **Numerical chromosomal abnormalities.**
   1. *Autosomal:*
      a. **Trisomies:**
         Extra-chromosome is present.
         e.g.
         - Trisomy 21 (Down syndrome).
         - Trisomy 13 (Patau syndrome).
         - Trisomy 18 (Edward's syndrome).
      b. **Monosomies:**
         One chromosome is missing.
         e.g. Monosomy 21 and 22.
   2. *Sex chromosomes:*
      a. Klinefelter syndrome 47; (44, XXY).
      b. Turner syndrome 45; (44, XO).
      c. Super female. 47; (44, XXX).

---

2. **Klinefelter syndrome.**

➔ *Cytogenetics:*
47; (44, XXY) (male).

➔ *Incidence:*
1/1000 male.

➔ *Features:*
1. Mild mental retardation + behavioral abnormalities.
2. Tall stature (narrow shoulder and broad pelvis).
3. Gynecomastia.
4. Hypogonadism with small testes and absent spermatogenesis.
5. Infertility (**most common presentation**).

➔ *Prognosis:*
Normal life expectancy.

➔ *Investigations:*
1. **Karyotyping (44, XXY).**
2. **Hormones:**
   a. FSH and LH markedly elevated.
   b. Low testosterone level.
3. **Gonadal biopsy:**
   Gonadal dysgenesis.

➔ *Treatment:*
Testosterone at time of puberty.

---

3. **Turner syndrome.**

➔ *Cytogenetics:*

45; (44, XO) (female).

➔ *Incidence:*

1/5000 (recurrence risk 1%).

➔ *Features:*

A. <u>Newborn:</u>

Lymphedema of hands and feet.

B. <u>Childhood:</u>

1. Short stature.
2. Low hairline.
3. Webbing of neck.
4. Shield-shaped thorax.
5. Widely spaced nipples.
6. Shortened 4th metacarpal.
7. Small fingernails.
8. Wide carrying angle (cubitus valgus).
9. Brown spots (nevi).
10. Normal mentality.
11. Hearing defect.
12. Autoimmune thyroiditis.
13. Coarctation of aorta (20%).
14. Renal anomalies (40%).
15. Poor breast development.
16. Rudimentary (streak) ovaries.
17. Infantile uterus.
18. No menstruation.

➔ *Investigations:*

1. <u>Karyotyping (44, XO).</u>

2. <u>Hormones:</u>

a. High FSH and LH.

b. Low estradiol.

3. <u>Gonadal biopsy:</u>

Gonadal dysgenesis (streak ovary).

➔ *Treatment:*

1. Growth hormone till puberty.
2. Then, cyclic estrogen and progesterone for secondary sexual characters only.

---

4. Super female.

➔ *Cytogenetics:*

47; (44, XXX) (female).

➔ *Features:*

1. Impaired mentality.
2. Reproductive problems.

5. X-linked dominant inheritance.

1. Affected female:

- Heterozygous or homozygous.
- Transmits the disorder to **half of her daughters** and **half of her sons** (if heterozygous) and **100%** (if homozygous).

2. Affected male:

- Homozygous.
- Transmits the disorder to **all his daughters** and **none of his sons**.

Examples:

1. Pseudo-hypo-parathyroidism.
2. Vitamin D resistant rickets.

---

6. Y-linked inheritance.

- Y chromosome carries genes that determine sexual differentiation and spermatogenesis.
- If affected, it leads to infertility.
- Genes on Y chromosome show **holandric inheritance** (passed exclusively from an affected man to all his sons and to none of his daughters).

---

7. Mitochondrial gene inheritance.

- Mitochondria contain small amount of DNA that code for enzymes involved in energy production.
- Mitochondria are transmitted to the embryo from his **mother only**.
- **Diseases include:**
  1. Mitochondrial myopathy.
  2. Mitochondrial encephalopathy.

---

8. Genetic counseling.

➔ *Definition:*

Providing information about inherited disorders in the family and how to avoid them (by prenatal diagnosis and carrier detection).

➔ *Genetic counseling should provide the recurrence risk:*

- Very low (1%) in chromosomal abnormalities.
- Recurrence in down syndrome (discuss, see before).
- 25-50% in single gene disorders.
- 2-5% in mitochondrial inheritance.

➔ *Indications:*

1. Consanguineous marriage indicates screening for autosomal recessive diseases based on diseases prominent in the population:

   e.g.

   a. Sickle cell anemia in black Africans.
   b. Thalassemia in Mediterranean area.
2. Indications of karyotyping (see before).
3. Microcephaly/Macrocephaly.
4. Bleeding tendency.

5. Metabolic disorders.

9. Early diagnosis of single gene disorders by DNA.

A. Prenatal diagnosis:

1. Beta thalassemia.
2. Cystic fibrosis.
3. Duchenne muscular dystrophy.

B. Pre-symptomatic diagnosis:

1. Huntington's disease.
2. Myotonic dystrophy.

C. Carrier detection:

a. <u>X-linked recessive diseases:</u>

- e.g. Duchenne muscular dystrophy, hemophilia.
- <u>Detection of carrier female by 2 methods:</u>
  - Biochemical assay: not reliable.
  - DNA markers: accurate.

b. <u>Autosomal recessive diseases:</u>

e.g. Cystic fibrosis.

IMPORTANT NOTES:

1- Prader Willi syndrome → hypotonia, obesity, hypogonadism (deletion of part of chromosome 15)
2- Sandal sign → big space between first and second toe (Down syndrome)
3- The more common type of down syndrome → non-disjunction
4- NO carrier in autosomal dominant diseases

Infections & vaccination

ESSAY QUESTIONS: (EXAMS)

1. **Describe the management outlines of a febrile infant or child. "June 2010"**
2. **What are the antipyretic measures in management of febrile infant and child? " June 2007 "**

A) General measures:

1. Bed rest
2. Easily digested food
3. Excess fluid
4. Supplementations with multivitamins in cases with prolonged dietary restriction.
5. Iron supplementation restriction

B) Antipyretic measures:

1. Sponging with tap water: not effective in lowering body temperature
2. Antipyretic drugs: orally or rectally every 4-6 hours
3. Acetaminophen "paracetamol": 10-15 mg/kg/dose
4. Ibuprofen "Brufen": 10-15mg/kg/dose
5. Diclofenac "Voltaren": 0.5-1mg/kg/dose
6. In case of hyperpyrexia above 41 C: intravenous acetaminophen is available

C) Specific treatment: According to the cause:

1. Viremia → No need for antibiotics
2. Simple infection "as tonsillitis / otitis media"→ oral antibiotics 7 days
3. Bacteremia→ broad spectrum antibiotics (IM)
4. In serious infections → as pneumonia, meningitis, peritonitis and septicemia (parenteral combined antibiotic therapy IV line)

Antibiotics in pediatric practice:

1. Penicillin "benzyl penicillin→Penicillin G "
   Broad spectrum penicillin (as ampicillin / amoxicillin)
2. Cephalosporin:
   - 1st generation: as cephalexin → for gram +ve
   - 2nd generation: as cefaclor → broad spectrum
   - 3rd generation: as cefotaxime → for gram –ve
3. Aminoglycosides:
   Gentamycin –amikacin: for gram –ve
4. Macrolides:
   Erythromycin / azithromycin → for gram +ve

---

3. **Discuss complications and management of the child with septicemia "Sep 2015"**

→ *Complications:*

1. serious focal infection: meningitis, pneumonia, osteomyelitis, arthritis

2. scleroma " skin hardening ": fatal complication in neonates
3. toxic encephalopathy: disturbed conscious, convulsions

➔ *Management **"Clinical picture, Investigation and treatment"***

A) Clinical picture (See emergency chapter).

B) Investigations:

1- CBC with differential:
   - leukocytosis ">15000 cells/mm3 "
   - Bandemia and toxic granulations

2- Acute phase reactants:
   - elevated CRP level between 20-30 mg/liter
   - Elevated ESR

3- Blood culture- Urine culture – CSF analysis and culture

4- Throat swap and culture

*C) Treatment: start **immediately on admission***

1. *Monitoring:*
   a. **Clinical:** HR/RR /BP/Peripheral perfusion /Urine Output
   b. **Laboratory:** Blood gases /electrolytes /blood sugar
   c. **Imaging**: chest x-ray / echocardiography
   d. **Central venous pressure and vascular resistance**
2. *Cardiovascular Support:*
   a. **Oxygen therapy**
   b. **Preload augmentation:**
      - crystalloid →Ringers lactate or normal saline
      - Others →albumin /plasma or whole blood
   c. **Contractility augmentation**: Inotropic drug: Dopamine or Dobutamine
   d. **Afterload reduction**: I.V drip Na nitroprusside.
   e. **TTT of arrhythmia**
3. *Respiratory support:*
   a. Oxygen therapy
   b. **Positive pressure ventilation** "either manual or mechanical"
4. *Treatment of the cause: combined parenteral antibiotic therapy*
   Broad spectrum antibiotic:
   - penicillin as ampicillin :100 mg /kg /day
   - aminoglycoside as gentamycin: 4-6 mg/kg/day
5. *Early management of complications*
   Give examples (renal failure, liver failure, ..)

---

4. Enumerate the common bacterial causes of septicemia in infant and children and Discuss its clinical features "June 2011"

➔ *Causes:*

1. **Gram –ve bacteria**: meningococci "most common", H. influenza, Klebsiella, E. coli
2. **Gram +ve bacteria**: Streptococci "in neonate is Group B strept"
3. **Source**: usually 2ry to focal infection "meningitis- pneumonia- arthritis"

➔ *Clinical features:*

a) clinical picture of the cause: "focal infection"

1. **Meningitis:** photophobia, convulsions, Purpura fulminans, disturbed conscious, increase intracranial tension "headache-blurring vision–projectile vomiting"
   Meningeal irritation: "Kernigs sign & Bradzneski sign"
2. **pyelonephritis:** fever, rigors, loin pain, turbid urine or hematuria
3. **Osteomyelitis, arthritis**

b) clinical picture of the disease "septicemia"

1. Hyperpyrexia with anorexia
2. Vomiting
3. Drowsy and poor general condition
4. Signs of poor perfusion:
   - Cold extremities
   - Skin mottling
   - Peripheral cyanosis
   - Delayed capillary refill > 5 sec.
   - Increase core-peripheral temperature difference >2 C
5. Signs of multiple organ system failure "MOSF"
   - Brain: hypoxic ischemic encephalopathy
   - Lung: Acute respiratory distress syndrome
   - Heart: Myocardial ischemia / arrhythmia
   - Kidney: Acute Renal failure
   - Metabolic: metabolic acidosis
   - Blood: DIC /Thrombocytopenia
   - Liver: Acute liver cell failure

c) clinical picture of complications:

1. Serious focal infection
   - Meningitis, osteomyelitis, arthritis, pneumonia
2. Sclerema "skin hardening"
   - Fatal complication in neonates
3. Toxic encephalopathy
   - Disturbed conscious, convulsions

---

5. Discuss Short febrile illness.

- It is more common and serious
- less than 7 days

A) Focal infection:

1. Simple Focal infections:

a. **Respiratory** (URTI is the most common)
   Nasopharyngitis, otitis media, sinusitis, bronchitis
b. **Digestive:** stomatitis, gastroenteritis
c. **Urinary:** Urinary tract infection "cystitis"
d. **Cutaneous:** cellulitis, abcess

- Detailed examination and history can discover the focus
- ENT examination is essential " otitis media is common "

2. Serious Focal infection:

a. **Meningitis:** disturbed consciousness, convulsions, meningeal irritation
Increased intracranial tension " headache, projectile vomiting, blurred vision "
b. **Pneumonia:** Respiratory Distress, Rales, Bronchial breathing
c. **Pyelonephritis:** loin tenderness or swelling, turbid urine or hematuria
d. **Peritonitis:** abdominal distension and generalized tenderness
e. **Osteomyelitis or arthritis:** tenderness, swelling, limitation of movement

N.B.:

- early focal infection "first 24 or 48 hours", the focus may not be evident (Re-examination after 24 or 48 hours reveals the focus in up to 40% of cases)

B) Simple fever "Non –specific fever"

Clinical diagnosis depends on:

1. Degree of fever
2. History: ***A***ppetite – ***A***ctivity - ***R***eaction to parents
3. Examination: ***A***ppearance – ***A***lertness - ***R***esponse to social stimuli

Viremia:

- **Fever**: low grade
- **History and examination**: Normal
- **Investigations**: not needed
- **Treatment:**
  - Antipyretic
  - Re-examination after 24-48 h. a focus may be found

Bacteremia:

- **Fever:** High grade
- **History and examination:** sick

"ألف من A A R"

- **Investigations:**

1. CBC: leukocytosis >15000/mm3
2. Band cell >10%
3. CRP: elevated to 20-30 mg/l
4. ESR >20 in 1st hour

- **Treatment:**

  - Oral broad-spectrum antibiotic (ampicillin or amoxicillin)
  - Re-examination after 24-48 hours

Septicemia:

A) clinical picture of the disease "septicemia"

1. Hyperpyrexia with anorexia
2. Vomiting
3. Drowsy and poor general condition
4. Signs of poor perfusion:
   - Cold extremities

- Skin mottling
- Peripheral cyanosis
- Delayed capillary refill > 5 sec.
- Increase core-peripheral temperature difference >2 C

5. Signs of multiple organ system failure "MOSF"
   - Brain: hypoxic ischemic encephalopathy
   - Lung: Acute respiratory distress syndrome
   - Heart: Myocardial ischemia / arrhythmia
   - Kidney: Acute Renal failure
   - Metabolic: metabolic acidosis
   - Blood: DIC /Thrombocytopenia
   - Liver: Acute liver cell failure

B) clinical picture of complications:

1. Serious focal infection
   - Meningitis, osteomyelitis, arthritis, pneumonia
2. Sclerema "skin hardening"
   - Fatal complication in neonates
3. Toxic encephalopathy
   - Disturbed conscious, convulsions

➔ *Management* ***"Investigation and treatment"***

A) Investigations:

1. CBC with differential:
   - leukocytosis ">15000 cells/mm3 "
   - Bandemia and toxic granulations
2. Acute phase reactants:
   - elevated CRP level between 20-30 mg/liter
   - Elevated ESR
3. Blood culture - Urine culture – CSF analysis and culture
4. Throat swap and culture

B) Treatment: start ***immediately on admission***

1. Monitoring:

a. **Clinical:** HR/RR /BP/Peripheral perfusion /Urine Output
b. **Laboratory:** Blood gases /electrolytes /blood sugar
c. **Imaging**: chest x-ray / echocardiography
d. **Central venous pressure and vascular resistance**

2. Cardiovascular Support:

a. **Oxygen therapy**
b. **Preload augmentation:**
   - crystalloid →Ringers lactate or normal saline
   - Others →albumin /plasma or whole blood

c. **Contractility augmentation**: Inotropic drug: Dopamine or Dobutamine
d. **Afterload reduction**: I.V drip Na nitroprusside.
e. **TTT of arrhythmia**

3. *Respiratory support:*
    a. **Oxygen therapy**
    b. **Positive pressure ventilation** "either manual or mechanical"
4. *Treatment of the cause: combined parenteral antibiotic therapy*

Broad spectrum antibiotic:

- penicillin as ampicillin :100 mg /kg /day
- aminoglycoside as gentamycin: 4-6 mg/kg/day

5. *Early management of complications*

---

6. Discuss prolonged fever

➔ *Def:* Duration more than 10-14 days

➔ *Etiology:*

A) infection "most common"

1. Bacterial*:*
    - *systemic infection*
        a. Salmonellosis
        b. Brucellosis
        c. Tuberculosis
        d. Listeriosis
    - *Hidden focal*
        a. Abdominal abcess
        b. Endocarditis
        c. Pyelonephritis
        d. Osteomyelitis
2. viral*:*
    a. Infectious mononucleosis
    b. CMV
    c. HIV
    d. HCV
3. *Parasitic:*
    a. Malaria
    b. Toxoplasmosis
    c. Visceral larva migrans

B) Autoimmune

1. Rheumatic fever
2. Juvenile rheumatoid arthritis
3. SLE

C) Malignancy

1. leukemia
2. lymphoma
3. Neuroblastoma

➔ *Management:*

Documentation of fever:

- parents may misinterpret normal temperature as fever
- parents may misinterpret 2 short febrile illnesses as prolonged fever

Diagnosis of the cause:

- Meticulous history and examination can help to reach diagnosis or DD
- If failed → you should differentiate between significant and non-significant illness
  - **if Good General condition (non-significant illness):** Simple investigation as an outpatient will show normal labs (CBC, CRP, ESR, Urine analysis)→So the condition is viral and need Reassurance and follow up
  - **if Bad General condition (significant illness)**
    - History: anorexia, weight loss
    - Examination: Toxic shock, pallor, cachexia, lymphadenopathy or hepatosplenomegaly → So Hospitalization

      1. **Documentation of fever "fever chart"**
      2. **Detection of new symptoms or signs**
      3. **Investigations**:

         A. Labs:

         1. CBC, CRP, ESR
         2. Cultures (blood, urine, sputum, CSF)
         3. Tuberculin, Widal
         4. Blood film (malaria)
         5. ANA

         B. Radiological:

         1. Chest x-ray
         2. Abdominal US
         3. Cardiac ECHO

         C. Invasive:

         1. Bone marrow biopsy
         2. Liver biopsy
         3. Lymph node biopsy

Blind empirical therapy should be avoided except:

1. Septicemia (causative organism can be identified in Only 50% of cases)
2. Blind anti-tuberculous therapy: when possibility of tuberculosis is strongly standing inspite of negative laboratory finding

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7. Mention cause, clinical manifestations, complications, diagnosis and treatment of scarlet fever. (July, 2014)

➔ *Cause:*

Erythrogenic toxin produced by group A beta hemolytic streptococci (cytokine release from stimulated T lymphocytes).

➔ *Mode of infection:*

Droplet.

➔ *Incubation period:*

2-4 days.

➔ *Clinical manifestations:*

1- *Prodroma:*
   - Fever (39-40°C).
   - Headache.
   - Anorexia.
   - Malaise (1-2 days).
   - Sore throat.
   - Vomiting and abdominal pain.

2- *Rash: Two types:*

A. *Enanthem (mucous membrane rash):*
   - Redness and edema over the tonsils, pharynx and palate.
   - White strawberry tongue: tongue is covered with a white coat with red edematous papillae emerging through the coat (1st day).
   - Red strawberry tongue: when the white coat peels off (3rd day).

B. *Exanthem (skin rash):*
   - Fine red popular rash (sandpaper rash or goose flesh) appears on 2nd day at the base of the neck and axillae (with more rise of temperature).
   - It becomes generalized within 24 hours (fades on pressure: +ve blanching test).
   - The cheeks are flushed with pallor around the mouth (circum-oral pallor).
   - The rash fades in 3 to 7 days by fine desquamation.
   - Desquamation begins on the face then trunk then hands and feet.
   - Hyperpigmentation in the flexural surfaces (in cubital fossa named pastia lines) that may last for weeks.

Scarlet fever timeline:

- *1st day → tongue and pharynx*
- *2nd day → rash on axillae and neck*
- *3rd day → tongue يقشر + generalized rash*
- *7th day → peeling and desquamation*

➔ *Complications:*

1. *Spread of the infection:*

A. *Local:*
   - Cervical adenitis.
   - Sinusitis.
   - Otitis media.
   - Mastoiditis.
   - Lateral sinus thrombosis.
   - Bronchitis.
   - Bronchopneumonia.

B. *Distant:*
   - Osteomyelitis.
   - Arthritis.
   - Meningitis.

2. *Late complications:*
   - No relation to severity.
   - Post streptococcal rheumatic fever.

- Post streptococcal glomerulonephritis.
- Erythema nodosum.

➔ *Diagnosis:*

1. Mainly clinical.
2. Throat culture: group A beta hemolytic streptococci.
3. Serologic tests: significant rise of antistreptolysin O titer (ASO titer).
4. CBC: leukocytosis (PNL 10000-20000/mm^3) – Secondary anemia.
5. Elevated ESR and CRP.

➔ *Treatment:*

1. Antibiotic therapy:
   - Oral penicillin V: 400.000 IU/dose 4 times/day/10 days.
   - Procaine Penicillin: injection for 10 days.
   - Erythromycin: 50 mg/kg/day in penicillin-sensitive patients for 10 days.
2. Antipyretics: for high fever.
3. Detection of late complications 2-3 weeks later.
4. Treatment of complications.

Prognosis:

- Excellent with treatment.
- Late complications doesn't depend on severity of the disease.

---

8. Enumerate complications of measles virus. (June, 2008)

Measles (Robeola)

Incidence:

It was the commonest before vaccination.

Cause:

Measles virus.

Mode of infection:

Droplet.

Incubation period:

10 days.

Period of infectivity:

From prodromal till 5 days after appearance of rash.

Clinical manifestations:

1. *Prodroma (3-5 days):*
   - **A. High fever > 38.5°C.**
   - **B. Conjunctivitis.**
   - **C. Dry Cough.**
   - **D. Runny nose.**
   - **E. Koplik's spots:**
     - **Pathognomonic sign** of prodroma.
     - Greyish white lesions with reddish areola on buccal mucosa opposite posterior molars.
     - Appear on **2nd day** of prodroma and disappear in **2 days.**

2. *Rash:*
   - Appears by the **4th day** behind the ears and on the face.
   - Spreads on the trunk in 24 hours.
   - Spreads to the feet in the next 24 hours.
   - Fades in the same order over the next 3 days by fine desquamation & leaves brownish discoloration.
   - Fever rises with rash > 40ºC & subsides in 2 days after appearance of rash.

Complications:

1. *Respiratory:*
   - Otitis media.
   - Laryngitis.
   - Bronchitis.
   - Pneumonia.
   - Activation of TB.
2. *Gastroenteritis – Appendicitis.*
3. *Neurological:*
   - **Febrile convulsions.**
   - **Encephalitis**: high incidence of mortality or long-term sequelae.
   - **Subacute sclerosing pan-encephalitis (SSPE):**
     - The measles virus persists in CNS.
     - Progressive over several years to dementia and death.
4. *With malnutrition and vitamin A deficiency:*
   Spread to the eye (corneal opacity).
5. *In immune-compromised:*
   Interstitial pneumonia (giant cell pneumonia): maybe fatal.
6. *Rare complications:*
   Retinitis, optic neuritis, myocarditis & DIC.

Management:

1. *Prophylaxis:*
   - Active immunization (discuss from vaccination).
   - Passive immunization with gamma globulin (0.25 ml/kg IM) 2-5 days after exposure.
2. *Treatment:*
   A. Symptomatic:
      - Antipyretics.
      - Decongestants.

   B. Antibiotics for complications as otitis media and pneumonia.
   C. Large doses of gamma globulin in encephalitis (to reduce complications).
   D. Oral vitamin A (400.000 IU) modulates the immune response to reduce morbidity.

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9. Describe the clinical features & differential diagnosis of roseola infantum.

Roseola infantum

➔ Incidence:
   - Usually occurs 6 months – 2 years of age (infants).

- **S**poradic, more common in **S**pring.

➔ *Cause:*

Human herpes virus-6.

➔ *Mode of infection:*

Droplet (oral secretions of a family member).

➔ *Incubation period:*

1 week.

➔ *Clinical picture:*

a) Prodroma: sudden by high fever (39-41 C) for 4 days with (no sign to explain it)

b) Rash:

- the fever by crisis on the fifth day with appearance of a maculopapular eruption appears on the trunk and spreads the trunk, the arms, the face and the legs.
- it fades within 24 hours only (rash may not develop)

Roseola (rule of "S"):

*- **S**IX months*

*- Herpes virus **S**IX*

*- **S**EVEN days incubation period*

➔ *Complications:*

1. Common cause of **febrile convulsions**.
2. Rare: aseptic meningitis & encephalitis.

➔ *Differential diagnosis (DD of maculopapular rash):*

1. Common exanthems (rash is obligatory):

- measles
- German measles
- roseola infantum
- scarlet fever

2. Other infections (rash maybe present):

- Typhoid fever
- Infectious mononucleosis
- Enteroviral infections
- Parvovirus B19 (slapped cheeks)
- Lyme disease (caused by borrelia, transmitted by ticks)
- Erythema migrans

3. Rheumatic diseases:

- Juvenile idiopathic arthritis
- SLE
- Dermatomyositis
- Kawasaki disease

4. Skin & allergic diseases:

- Sweat rash: fine papules on the neck and trunk.
- Urticarial rash: wheals with itching
- Drug rash

➔ *Treatment:*

1. Antipyretics for fever.
2. Sedatives in infants susceptible to febrile convulsions.

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10. Clinical manifestation of chickenpox.

Chicken pox (varicella)

Incidence:

The most common between 2-10 years (but may affect any age).

Cause:

Varicella-Zoster virus.

Mode of infection:

1. Droplet.
2. Contact with vesicle fluid (but dry scales are not infective).

Incubation period:

2-3 weeks.

Period of infectivity:

24 hours before the rash, up to 7 days after the rash.

Clinical manifestations:

A. *prodroma of mild FAHM (24hour)*
B. *mucous membrane*: vesicles that rupture leaving ulcers (before skin rash)
C. *skin*: **the rash show the following criteria**
    1. **Successive crops**: it appears in successive crops over 3-4 days, each crop consists of small red papules that rapidly turn to vesicle (tear drops) then pustules then crust that falls with no scar
    2. **Centripetal distribution**: it starts the trunk and spreads to the body
    3. **Pleomorphic:** crusts of the earliest rash with pustule together with papules of the latest rash are present simultaneously
    4. **Pruritic:** pruritis may be severe

Complications:

1. *Secondary bacterial infection & sepsis:*
   With staph., strept. (toxic shock syndrome or sepsis).
2. *Encephalitis:*
   - Usually **cerebellitis.**
   - Also myelitis, polyradiculitis and encephalitis can occur.
   - **Good prognosis.**
3. *Purpura fulminant or strokes:*
   - Large areas of skin necrosis.
   - Caused by increased risk of clotting due to vasculitis or protein S deficiency.
4. *Neonatal varicella and in immune-compromised (as those receiving steroids):*
   Severe progressive disseminated disease, often **fatal.**

Prophylaxis:

1. Live attenuated varicella vaccine (discuss from vaccination).
2. VZIG (varicella zoster immunoglobulin) : post-exposure, early in IP.

Treatment:

1. **A**ntipruritic agents (local and systemic).

2. **A**ntipyretics.
3. **A**spirin should not be used (risk of Reye's syndrome: acute encephalitis with fatty liver).
4. **A**ntibiotics in case of 2ry bacterial infection.
5. **A**ntiviral drugs (Acyclovir):
   IV if immunocompromised, encephalitis or pneumonia.

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11. Mumps (epidemic parotitis): ***Aetiology & Clinical Picture. (July 2015)***

➔ *CO:* myxo-virus parotitis (mumps virus)

➔ *MOT:* droplet infection

➔ *Incubation period:* 2-3 weeks.

➔ *Clinical Picture:*

A. *Subclinical 30%*

B. *Prodroma of FAHM* (fever disappears after 4 days)

C. *diagnostic phase*:

- pain at (one or both sides) of parotid around the ear aggravated by chewing of mandible
- swelling → elevated ear lobule
  → behind angle of mandible
  → painful and tender
  → peak at 3 days, disappears over 3-7
  → hyperaemia of stenosed duct

➔ *Complications: (July 2015/Sep. 2010/2009)*

عاشق الCNS والglands

A. CNS: meningoencephalomyelitis:

- Incidence: more in males
- Onset: 3-10 days after parotitis
- C/P: CCII
- investigations: CSF analysis: (clear CSF, 15-20,000 lymphocytes, normal glucose, normal Ptn)

B. Epididymo-orchitis: (G)

- Incidence: 25% in post pubertal males - rare in pre-adolescent
- C/P: fever (3-5 days), swelling, redness, lower abdominal pain
- Prognosis: 13% = infertility

C. Oophritis: (G)

- severe pain

D. Pancreatitis: (G)

- C/P: epigastric pain, tenderness, vomit & fever
- Investigations: Diagnosis is mainly clinical + elevated serum amylase
- good prognosis

E. Others:

- auditory neuritis
- optic neuritis
- scleritis
- renal thrombosis
- myocarditis, arthritis, thyroiditis (rare)

➔ *D.D. (Sep. 2010/ July 2015):*

- *Cervical lymphadenitis:*
    - not elevated lobule
    - better felt than seen
    - firm, multiple
- *Other parotitis causes:*
    - suppurative parotitis: unilateral, high grade fever, severe pain.
    - recurrent parotitis
    - calculus duct obstruction: intermittent swelling
    - Micklucz' syndrome: dry mouth, bilateral parotid, lacrimal swelling

➔ *Management: (July 2012/ Sep. 2009)*

A. *prophylaxis:*
- passive → mumps γ globulin early in IP
- active → **MMR vaccine**:
    - live attenuated vaccine of measles, mumps and rubella
    - 10 yrs. Protection
    - 0.5 ml SC
    - given @ 12 months
    - booster > 16 yrs.
    - Contraindicated if immune def./pregnancy

B. *Symptomatic TTT:*
    - analgesic antipyretic

C. *TTT Of Complications:*
    - orchitis → ice packs supported testes to decrease edema.
    - encephalitis → control convulsions (diazepam) & ↑ ICT (acetazolamide, diuretics)

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12. list compulsory /obligatory in the 1ST year of life (sep 2008, June 2007, June 2012, sep 2011)

Time	*Vaccine*	*Dose*
At birth or during 1ST month of life	BCG oral poliomyelitis vaccine	BCG=0.1 ml ID Polio=2drops-oral
2 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml IM
4 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml IM
6 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml, IM
9 months	Oral polio vaccine Vit A	2 drops oral 100,000 IU oral
12 months	Oral polio vaccine	2 drops oral

	MMR vaccine	0.5 ml-SC

13. Oral polio vaccine (June 2009-sep 2007)

Compulsory vaccine in Egypt

1. *Nature:* (oral Sabin) live attenuated vaccine
2. *Protection:* provide both humoral &local immunity
3. *Dose:* 2 drops "oral "
4. *Schedule:* 0-2-4-6-9-2 months
5. *Booster:* 1.5 -4.5 years
6. *Side effect*: transient mild diarrhea
7. *Complication:* very rare to be associated with paralytic ileus
8. *CI:*
   a. diarrhea or infection
   b. in breast feeding before or after BF by 1 hour
   c. immune deficiency

14. Discuss the recommended vaccination schedule in 1ST Year with contraindication & possible complication (June 2013)

"See before"

Time	*Vaccine*	*Dose*
At birth or during 1ST month of life	BCG oral poliomyelitis vaccine	BCG=0.1 ml ID Polio=2drops-oral
2 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml IM
4 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml IM
6 months	Oral polio vaccine DPT vaccine Hepatitis B vaccine	2 drops, oral 0.5 ml, IM 0.5 ml, IM
9 months	Oral polio vaccine Vit A	2 drops oral 100,000 IU oral
12 months	Oral polio vaccine MMR vaccine	2 drops oral 0.5 ml-SC

Vaccine	*Complication*	*Contraindication*
BCG	- axillary lymphadenopathy - Abscess formation	- Immunodeficiency - Pregnancy - Tuberculin positive - Immune compromised
DPT	- Convulsion - Encephalopathy	- Pertussis vaccine is contraindicated in

		presence of seizures "epileptic febrile" - Children above 6 years - Acute illness-fever
Oral polio vaccine	- Very rare - Vaccine associated paralytic ileus	- Diarrhea or infection - In breast feeding should be given before or after the BF by 1 hour - Immunodeficiency
Hepatitis B vaccine	No complication	No contraindication
MMR	Fever-coryza like symptoms As side effect but no complication	- Immune deficiency - During pregnancy - Egg yolk hypersensitivity

15. mention types, indication, schedule vaccination of non-compulsory vaccines (sep 2013-sep 2014)

<u>Can be classified in oral exam into:</u>

- Bacterial (capsular, toxin)
- Viral (live attenuated, killed)

Vaccine	*Nature*	*Indication*	*doses*	*Schedule*
D.T. vaccine	Toxoid of diphtheria & tetanus	Above the age of 6 years if DPT is CI	0.5 ml, IM	
Meningococcal	Capsular poly-saccharide of A, Ac, C, W135	- In endemics of meningococcal meningitis - Hyposplenism cases - Important before 5 years	0.5 ml, IM	Single dose with booster after one year
Hib vaccine	Capsular poly-saccharide vaccine	- Prevention invasive hib diseases caused by hemophilus influenza as meningitis, pneumonia - In case of hyposplenisim and splenectomy - Before 5 years	0.5 ml, IM	2, 4, 6 months then booster at 2,5 months
Pneumococcal conjugate vaccine	conjugate with diphtheroid toxoid (against 3 types)	- Compulsory vaccine in many countries - All at risk children (Splenectomy – Asplenia-SCA) - invasive pneumococcal infection below 5 years	0.5 ml, IM	2,4,6 months then booster at 12,15 months

Pneumococcal Polysaccharide vaccine	Capsular polysaccharide against 23 serotypes	- Compulsory vaccine in many countries - All at risk children (Splenectomy – Asplenia - SCA) - Reduces invasive pneumococcal infection below 5 years	0.5ml, IM	Not before age of 2 years
Rota virus vaccine	Live attenuated vaccine Monovalent, pentavalent	CI in cases of history of intussusception &immunodeficiency	Oral	- Monovalent 2,4 months - Pentavalent 2,4,6 months - 1ST < 4 months - Last < 3 years
Hepatitis A vaccine	In activated hepatitis A virus	Above age of 1 year In area where HAV is common	0.5 ml, IM 1 ml, IM If > 15 years	2 doses 6 month apart
Chicken pox vaccine	Life attenuated vaccine	Above age of 1 year	0.5 ml, IM	At 1 year Booster 4-6 years
Rabies vaccine	Live attenuated vaccine	subjected to unprovoked bite of a domestic or wild animal	1 ml, IM	At 0,3,7,14,28 days local ttt of the wound is important
Seasonal influenza vaccine	inactivated vaccine	> age of 6 months especially with - Cardiac disease - Immune deficiency - Recurrent chest infection - Asthmatic children	0.25 ml, IM (6-36) months 0.5ml IM>36 months	Every year

OTHER TOPICS:

1. Fever with purpuric rash.

1. *Serious bacterial infection (20%):*
   a. **Meningococcal septicemia** is the **most common.**
   b. Hemophilus influenza type b.
   c. Staphylococci.
   d. Listeria.

Diagnosis:

- Fever, headache, malaise, anorexia.
- Vomiting, coma, convulsions & signs of increased intracranial tension + meningeal irritation.

Management:

- Urgent hospitalization.
- CBC, CRP, ESR.
- Blood culture & CSF examination,
- ABG & blood glucose.
- Treatment with broad-spectrum antibiotics.

2. *Viral infections (80%):*
   a. Enterovirus infection esp. **echovirus type 9** (**most common**).
   b. Hemorrhagic fevers: **B**lack measles, **C**ytomegalovirus and **D**engue fever.

---

2. Causes of vesiculopapular rash.

1. *Infections:*
   a. Chicken pox & shingles.
   b. Herpes simplex.
   c. Coxsachie (hand and foot syndrome).
   d. Scarlet fever (bacterial).
   e. Impetigo.
2. *Skin and allergic diseases:*
   a. Erythema multiforme (Steven Johnson syndrome).
   b. Papular urticarial.

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3. German measles (Rubella)/Infectious mononucleosis/Herpes simplex.

	German Measles	**Infectious mononucleosis**	**Herpes simplex**
Causative organism	Rubella virus	Epstein-Barr virus.	HSV-1 & 2
Mode of infection	Droplet	Oral contact (kissing disease) Droplet	HSV-1: body fluids as saliva HSV-2: sexual transmission and neonate (birth canal)
Incubation period	2-3 weeks	4-14 days.	3-5 days

Period of infectivity	7 days before rash to 5 days after prodromal		
Clinical picture	**<u>1. Prodroma:</u>** - Milder and shorter than measles (**1 day**). - Fever, cough, sneeze. - **Lymphadenopathy** (occipital and posterior cervical, maybe generalized). **<u>2. Rash:</u>** - Appears by **2nd day** on face. - Spreads to trunk & limbs **on same day.** - Fades by 3rd day by minimal desquamation **(= 3 day measles).** - Temperature remains **low grade**.	- Fever, malaise, anorexia. - Macular rash may occur esp. if **Ampicillin** is given. - Pharyngitis is common with **thick white exudate on tonsils.** - Cervical **lymphadenopathy & splenomegaly** are common.	**<u>1. Neonatal infection:</u>** If pregnant mother has genital herpes (type 2) at delivery. Vesicular rash, HSM, bleeding, encephalitis, lethargy or coma. Elective CS should be considered. **<u>2. Acute gingivostomatitis</u>** (see GIT). 3. **<u>Keratoconjunctivitis:</u>** - Severe eyelid edema. & dendritic corneal ulcers. - Treated by idoxuridine. **<u>4. Cold sores:</u>** Recurrent herpes as around the mouth. **<u>5. Meningoencephalitis</u>** (see neuro).
Complications	**<u>Uncommon:</u>** 1. Neuritis. 2. Encephalitis. 3. Thrombocytopenia. 4. Arthritis or carditis. 5. **<u>Congenital rubella syndrome:</u>** - Very high risk < 8 weeks (termination of pregnancy). - Risk reduces markedly after 18 weeks gestation. - Inv. & ttt: neonatology chapter.		
Management	**<u>1. Prevention:</u>** - Active vaccination (discuss). - Pregnant mothers	**<u>1. Investigations:</u>** - Lymphocytosis with atypical lymphocytes. - Positive monospot	

	should avoid exposure. **2. Treatment:** - Symptomatic. - Antibiotics if 2ry bacterial infection.	test in 60% of cases. - Viral capsid antigen (VCA) or EB nuclear antigen (EBNA). **2. Treatment:** - Symptomatic.	

4. Diphtheria and tetanus.

	Diphtheria	**Tetanus**
Causative organism	Corynebacterium diphtheria (gram +ve).	Clostridium tetani (Gram +ve spore-forming) Produces neurotoxin (tetanospasmin) with strychnine-like action.
Mode of infection	Droplet (Incidence decreased markedly with vaccination)	Contamination of wounds by spores. Umbilical stump in newborn.
Incubation period	2-7 days	1-2 weeks
Clinical manifestations	**1. Faucial diphtheria:** - **Low grade** fever. - **Tonsillar membrane** (may spread to pharynx). - Huge cervical lymphadenopathy (**Bull neck**). - Severe toxemia with rapid pulse. **2. Laryngeal diphtheria:** - Hoarseness of voice. - Brassy cough. - Stridor. **3. Nasal diphtheria:** - Rare. - Offensive nasal discharge.	1. Trismus (lock jaw). 2. Fever, neck and back rigidity and generalized tonic convulsions. 3. Risus sardonicus (spasm at angle of mouth). 4. Respiratory distress and coma that may end in death.
Complications	1. Myocarditis. 2. Laryngeal obstruction. 3. Post-diphtheritic paralysis: - Bilateral, symmetrical, purely motor. - Descending (palatal then ocular then diaphragmatic then limbs). - Resolves completely in few weeks.	1. Pneumothorax. 2. Atelectasis. 3. Emphysema. 4. Vertebral and rib fractures.
DD	1. Faucial diphtheria from other causes of tonsillar	

	membrane (follicular tonsillitis, infectious mononucleosis, agranulocytosis and leukemia). 2. Laryngeal diphtheria from other causes of stridor.	
Management	**1. Prevention** (discuss vaccine). **2. Treatment:** a. Anti-toxin 40.000-100.000 units IM. b. Penicillin 600.000 units IM for 7 days. c. Erythromycin 40 mg/kg/day if penicillin-sensitive. d. Supportive ttt: - Absolute bed rest in myocarditis. - Tube feeding in case of parlysis to avoid aspiration.	**1. Prevention**: a. Discuss DPT vaccine). b. Tetanus vaccine to pregnant mothers (beter before gravidity). c. Following injury: d. Cleaning the wound. e. If not immune, give human tetanus Ig 250-500 units IM. f. If not available, give tetanus antitoxin 3000 units. **2. Treatment:** a. Supportive ttt: - Isolation in quite-dark room. - Anti-convulsants. - IVF & oxygen. b. Penicillin G 100.000 U/kg/day IV for 10 days. c. Cleaning the wound + left open. d. Tetanus Ig 3000-6000 units IM. e. If Ig is not available, give tetanus antitoxin 50.000-100.000 units (half IM and half IV).

IMPORTANT NOTES:

1. Strawberry tongue/ sandpaper rash / goose flesh / +ve blanching test → scarlet fever
2. Pastia lines → hyperpigmentation of flexural surfaces in scarlet fever
3. Koplik's spots/ SSPE (subacute sclerosing pan encephalitis)→ measles
4. Febrile convulsions → roseola infantum
5. Aspirin is NOT used in ttt of chickenpox for fear of Reye's syndrome
6. Risus sardonicus → spasm of angle of mouth in tetanus

Emergency

"Chapter مهم جدًا جدًا"

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **Define stridor. Mention its clinical grading, causes and management.**
   Mention causes and treatment of acute stridor in infancy.
   Enumerate the causes of stridor and discuss its management.

➔ *Definition:*

Harsh inspiratory sound due to partial obstruction in larynx or trachea.

➔ *Causes:*

A. Infections (croup):

1. Acute laryngitis:

Milder than laryngo-tracheo-bronchitis.

2. Acute laryngo-tracheo-bronchitis:

Both 1 & 2 have the following details:

a. Etiology:

- **Para influenza virus** (75%).
- Influenza virus.
- Respiratory syncytial virus.

b. Clinical picture:

- Prodroma of rhinitis (2 days).
- **Barking cough.**
- Harsh stridor.
- Hoarseness.
- Fever & coryza.

3. Bacterial tracheitis:

a. Etiology:

- Staph. aureus.
- Pneumococcus.
- Hemophilus influenzae.

b. Clinical picture:

- **High** fever.
- Toxemia.
- Severe stridor.
- Excess airway secretions.

4. Acute epiglottitis:

Acute life-threatening illness.

a. Etiology:

Hemophilus influenzae type b.

b. Clinical picture:

- Very acute onset.
- **High fever** (> 40ºC).
- Toxic appearance.
- Severe progressive stridor.
- Cough is **minimal or absent.**
- Severe **sore throat**.
- Child **can't speak or swallow.**

5. *Spasmodic laryngitis.*

B. Other causes:

1. *Laryngospasm:*
   As in hypocalcemic tetany.
2. *Laryngomalacia:*
   Recurrent or continuous stridor since birth.
3. *Laryngeal edema:*
   - With severe allergy.
   - Following extubation.
4. *Laryngeal foreign body (peanut or toy):*
   Sudden onset of cough.
5. *Laryngeal compression:*
   Retropharyngeal hematoma or abscess.
6. *Laryngeal diphtheria, measles or infectious mononucleosis.*

➔ *Clinical grading of stridor:*

1. *Grade I:*
   Exertional stridor (during crying or exercise).
2. *Grade II:*
   - Stridor at **rest.**
   - Becomes worse with crying.
3. *Grade III:*
   Stridor with **retractions** (suprasternal and supraclavicular).
4. *Grade IV:*
   Stridor with **cyanosis** and disturbed consciousness.

➔ *Treatment of croup:*

i. Home management:

Indications:

- Grade I.
- Grade II if > 1 year old.

1. Warm moist environment (hot steam).
2. **Oral** steroids.
3. Close observation (if worsening → refer to hospital).

ii. Hospital management:

Indications:

- Grade II if < 1 year old.

- Grade III and IV.
- Suspected bacterial infection (high fever, toxemia, …).

1. Oxygen therapy + pulse oximetry.
2. Steam inhalation by ultrasonic nebulizer.
3. **Parenteral** steroids.
4. Antibiotics (if suspected bacterial infection).
5. Close observation (if worsening → intubation).

iii. Treatment of acute epiglottitis (ICU):

1. Endotracheal intubation (very skilled hand).
2. Parenteral cephalosporin (recover within 2-3 days).
3. Rifampicin for close contacts (prophylaxis).

---

2. Define acute respiratory failure and differentiate between its two types.
Type 2 respiratory failure.

➔ *Definition:*

Inability of respiratory system to keep adequate blood levels of CO_2 & O_2.

➔ *Incidence:*

More than 50% of deaths in PICU *(pediatric ICU).*

➔ *Types:*

	Type I (Lung failure or oxygenation failure)	**Type II (Pump failure or hypercapnic failure)**
Causes	**Respiratory distress causes:** - Croup. - Epiglottitis. - **A**spiration. - **A**cute severe asthma. - **B**ronchiolitis. - **B**ronchiolitis obliterans. - **B**roncho-pulmonary dysplasia. - **P**leural effusion. - **P**neumothorax. - **P**neumonia. - **P**ulmonary edema. - Adult respiratory distress syndrome (**ARDS**). - Neonatal respiratory distress syndrome (**NRDS**). - Lung collapse.	**Respiratory depression:** - CNS infection. - Intracranial hemorrhage. - CNS depressants as morphine. **Respiratory muscle paralysis:** - Guillain-Barre syndrome. - Poliomyelitis. - Myasthenia. - Werdnig-Hoffmann disease. **Respiratory muscle fatigue (severe type I failure):** - Severe pneumonia. - Severe RDS.

Defect	Hypoxemia.	Hypoventilation (hypercarbia).
Clinical picture	Grades of respiratory distress (see below).	Shallow irregular breathing or apnea.
ABG	- Low PO_2. - Metabolic acidosis.	- High PCO_2. - Respiratory acidosis.
Treatment	Oxygen therapy (free flow or with positive pressure ventilation according to ABG).	Mechanical ventilation (with or without oxygen).

➔ *Causes of respiratory distress:*

1. Pulmonary or airway causes (see causes of type I failure).
2. Heart failure.
3. Metabolic acidosis.
4. Severe anemia.

➔ *Grades of respiratory distress:*

1. Grade I: tachypnea.
2. Grade II: retractions.
3. Grade III: grunting.
4. Grade IV: cyanosis.

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3. Give a full account on oxygen therapy.

➔ *Indications:*

1. Hypoxic respiratory failure.
2. Potential hypoxia (respiratory distress).
3. Circulatory failure (shock).
4. Neurological failure (deep coma).

➔ *Oxygen source:*

1. Wall oxygen source.
2. Oxygen cylinders.
3. Oxygen concentrator.

➔ *Methods of administration:*

1. Incubators.
2. Simple face mask.
3. Venturi mask.
4. Head box.
5. Nasal prongs.
6. Endotracheal tube.

➔ *Precautions:*

1. Oxygen should be humid and warm.
2. Keep on the least possible FiO_2 (fraction of inspired O_2).
3. Stop oxygen when not indicated.

N.B. Currently, FiO_2 is used instead of O_2 concentration.

➔ *Dose of oxygen:*

- Use the minimum FiO_2 that can achieve acceptable PaO_2.
- It is not necessary to reach normal PaO_2.
- Start with 100% oxygen only in presence of cyanosis (otherwise, start with 40-60%).
- Readjust the dose according to response.

➔ *Assessment of response:*

1. Clinically:
   - Color of the patient.
   - Degree of respiratory distress.
2. Pulse oximeter:
   Increase in SaO_2.
3. ABG:
   Increase in PaO_2.

➔ *Complications of oxygen therapy:*

1. Eye toxicity:
   Retinopathy of prematurity (ROP).
2. Lung toxicity:
   - Destruction of pneumocytes; leading to decreased surfactant production.
   - Broncho-pulmonary dysplasia (BPD).
3. Oxygen dependency (difficult weaning).

+ Discuss positive pressure ventilation.

---

4. Enumerate advantages and disadvantages of self-inflating bags used in manual positive pressure ventilator support.

"مطلوب advantages & disadvantages بس إحنا في الملزمة كاتبين الموضوع كله عشان لو جه أسئلة على باقي النقط وعشان السؤال بـ١٥ درجة".

Positive pressure ventilation (PPV)

i. Manual positive pressure ventilation

➔ *Indications:*

1. During CPR.
2. During physiotherapy and suction.
3. During patient transport.

➔ *Technique:*

1. Bag and mask.
2. Bag and tube.

➔ *Types of bags:*

1. *Self-inflating bag (Ambu bag):*
   a. *Advantages:*
      - Easy to use.
      - Give 40% O_2 and 100% O_2 with reservoir.
      - Pressure release (safety pop-off) valve makes over-inflation less likely.
   b. *Disadvantages:*
      - It will inflate even if there is not a good seal between the mask and patient's face.
      - Requires reservoir to deliver 100% oxygen (only 40% without reservoir).
      - Can't be used as a device for free flow of oxygen.

2. *Flow-inflating bag (anesthesia bag/Jackson-Rees bag):*

a. *Advantages:*

- Delivers 100% O_2 at all times.
- Easy to determine when there is a good seal on the patient's face.
- Stiffness of the lung can be felt.
- Can be used to deliver free flow 100% oxygen:

  Once oxygen enters the bag, it is not diluted (same concentration of oxygen that enters the bag is delivered to the patient).

b. *Disadvantages:*

- Requires a tight seal between the mask and the patient's face.
- Requires a gas source to inflate.
- Usually does not have a safety pop-off valve.

ii. Mechanical positive pressure ventilation

➔ *Indications:*

1. Apnea not responding to simple measures.
2. Hypoxia not responding to simple measures.
3. Hypercapnia not responding to simple measures.
4. Supportive, after:
   a. CPR.
   b. Major **S**urgery.
   c. **S**hock.
   d. **S**tatus epilepticus.
5. Therapeutic hyperventilation to reduce intracranial tension.

➔ *Parts of the ventilator system:*

1. Oxygen source.
2. Oxygen blender.
3. Ventilator.
4. Humidifier.
5. Patient breathing circuit.

➔ *Modes of support:*

1. Continuous positive airway pressure (CPAP).
2. Intermittent mandatory ventilation (IMV).
3. Controlled mechanical ventilation (CMV).
4. High-frequency ventilation (rate between 300-600).

---

5. Mention etiology, clinical manifestations, investigations and treatment of congestive heart failure (ACHF).

Describe the treatment of acute congestive heart failure.

Define and list causes of acute congestive heart failure.

➔ *Definition:*

- Failure of the heart to do its function as a pump (into the systemic circulation or the lung).
- In acute congestive heart failure, symptoms are acute and evident at rest.

Normal cardiac performance depends on:

1. *Preload.*
2. *Contractility.*
3. *Afterload.*
4. *Rhythm*

➔ *Causes:*

1. *Preload failure (volume overload):*
   a. Acute renal failure.
   b. Over infusion.
   c. Large left to right shunt, as:
      – VSD.
      – PDA.
      – TGA.
2. *Contractility failure (decreased myocardial contractility):*
   a. Myocarditis (viral or rheumatic).
   b. Negative inotropic factors:
      – Hypoxia.
      – Hypoglycemia.
      – Acidosis.
      – Cardiomyopathy.
3. *Afterload failure (pressure overload):*
   a. Aortic **S**tenosis.
   b. **S**evere coarctation of the aorta.
   c. **S**ystemic hypertension.
4. *Arrhythmic failure:*
   a. Severe tachycardia (SVT: supraventricular tachycardia).
   b. Severe bradycardia.

➔ *Signs (Grading) of ACHF:*

1. *Grade I (heart failure only):*
   a. **T**achycardia:
      Compensatory mechanism.
   b. **T**achypnea:
      Caused by pulmonary congestion (backward failure).
   c. **T**ender enlarged liver:
      Caused by systemic congestion.
   d. Cardiomegaly.
2. *Grade II (heart failure + respiratory failure):*
   As grade I +
   a. Marked respiratory distress and basal crepitations (due to pulmonary edema).
   b. Chest x-ray: pulmonary congestion or edema.
   c. ABG: hypoxia and/or hypercapnia.
3. *Grade III (heart failure + cardiogenic shock):*
   a. Severe respiratory distress (cyanosis).

b. Signs of shock including signs of poor peripheral perfusion and multiple organ system failure (MOSF):

Discuss as in shock (see later).

➔ *Investigations:*

1. Chest x-ray.
2. ECG (arrhythmia).
3. Echo (chamber size and cardiac anomalies).
4. Lab investigations: CBC, ESR, CRP & ASOT.

➔ *Management:*

i. Treat heart failure first:

1. Grade I:

*a. Fluid **rest**riction:*

- To 60-70%.
- If distressed, IV fluids are used.
- When tolerating, nasogastric tube then oral feeding.

*b. Salt **rest**riction.*

*c. **Rest** in semi-sitting position.*

d. Oxygen therapy:

- Reduces distress and hypoxia.
- Given warm and humidified, by mask or nasal prong.
- Initial FiO_2: 40-60%.

*e. **D**igitalis:*

- Digitalizing (loading) dose:

  IM or IV 0.05 mg/kg (3 doses/24 hours).
- Maintenance dose:

  IM or IV 0.01 mg/kg/day (2 doses, daily).
- Shift to oral digoxin if oral feeding is tolerated.

*f. **D**iuretics (furosemide "Lasix"):*

- IM or IV 1-2 mg/kg/dose/12 hours.
- Shift to oral if tolerated.

2. Grade II:

As in grade I, but:

a. Diuretics: IV, higher dose.
b. Digoxin, IV.
c. Add IV drip of **dopamine or dobutamine**.
d. **CPAP or mechanical ventilation** for severe respiratory distress.

3. Grade III:

As in grade II, but:

a. Digoxin is **not suitable** as inotrope.
b. After-load reducing agents (vasodilators) are used in refractory cases.

ii. Treat the cause:

1. Rheumatic fever.
2. Hypertensive crisis.

3. Acute renal failure.
4. Arrhythmia, ... etc.

---

6. List the early and late signs of shock in pediatric patient.
Enumerate types of shock and mention two causes for each type.
Mention types of shock and basic steps in its treatment.

<u>Shock = acute circulatory failure.</u>

➔ *Definition:*

A state of circulatory dysfunction, resulting in inadequate delivery of oxygen and nutrients to tissues (tissue hypo-perfusion).

➔ *Clinical grading:*

1. *Grade I (early shock):*

   <u>Tachycardia and peripheral hypo-perfusion:</u>

   a. **C**old extremities.
   b. Skin mottling.
   c. Peripheral **C**yanosis.
   d. Delayed **C**apillary refill (> 5 seconds).
   e. Increased **C**ore-peripheral temperature difference (> 2ºC).

2. *Grade II (established shock):*

   Tachycardia and tissue hypo-perfusion + **<u>hypotension</u>**.

3. *Grade III (advanced shock):*

   <u>Multiple organ system failure (MOSF):</u>

   a. Brain → hypoxic ischemic encephalopathy.
   b. Lungs → acute respiratory distress syndrome.
   c. Heart → myocardial ischemia and arrhythmias.
   d. Kidneys → acute renal failure.
   e. Metabolic → metabolic acidosis.
   f. Blood → DIC and thrombocytopenia.
   g. GIT → stress ulcers.
   h. Liver → acute liver cell failure.

4. *Grade IV (irreversible shock):*

   Refractory metabolic acidosis.

➔ *Causes (types) of shock:*

<u>SHOCK</u>

1. ***<u>H</u>ypovolemic shock (most common):***
   a. <u>Severe dehydration due to:</u>
      – Gastro-enteritis.
      – Vomiting.
      – Diabetic keto-acidosis.
      – Diminished intake.
   b. Acute hemorrhage (internal or external).
   c. Severe burn.
2. *Distributive (<u>K</u>inetic) shock:*

Loss of vascular resistance and excess vasodilation.

a. Sepsis.
b. Anaphylaxis (drugs).
c. Neurogenic (spinal cord trauma).

3. ***C****ardiogenic shock:*
   a. Severe acute heart failure.
   b. Sepsis.
   c. Any advanced shock.
4. ***O****bstructive shock:*

   Mechanical obstruction of cardiac blood flow.
   a. Tension pneumothorax.
   b. Cardiac tamponade.
5. ***S****eptic shock:*
   - Mixed form of shock, but it is mainly a distributive shock.
   - Results from activation of systemic inflammatory response (from bacterial or viral infection).

➔ *Hemodynamic parameters in different types of shock:*

Type of shock	SVR	CVP	Cardiac output
Hypovolemic	↑	↓	↓
Cardiogenic	↑	↑	↓
Distributive	↓	↓	↑

– SVR = systemic vascular resistance.
– CVP = central venous pressure.

➔ *Management of shock:*

1. *Monitoring:*
   a. Clinical:
      – Vital signs: heart rate, respiratory rate & blood pressure.
      – Peripheral perfusion.
      – Urine output.
   b. Laboratory:
      – Blood gases.
      – Electrolytes.
      – Blood sugar.
      – Cultures.
   c. Imaging:
      – Chest x-ray.
      – Echocardiography.
   d. Central venous pressure and systemic vascular resistance.
2. *Cardiovascular support (according to the type):*
   a. Oxygen therapy.
   b. Pre-load augmentation:
      – Crystalloid such as Ringer's lactate or normal saline:
        20 ml/kg over 15 minutes.

- Others:
  Albumin, plasma or whole blood.

c. <u>Contractility augmentation:</u>
- Inotropic drugs:
  Dopamine or dobutamine.

d. <u>After-load reduction:</u>
- IV drip of sodium nitroprusside.

e. <u>Treatment of arrhythmia.</u>

3. *Multi-system support (any organ affected in MOSF).*
4. *Specific treatment:*

e.g. Chest tube for tension pneumothorax, treatment of infections, etc.

---

7. Discuss management of comatose patient.

Coma

➔ *Definition:*

- A state of unconsciousness from which the patient can't be aroused by painful stimuli.
- Consciousness needs intact **<u>reticular activating system</u>** (extends from medulla to midbrain to both cerebral hemispheres).
- <u>Coma is caused by either:</u>
  - Bilateral **diffuse** cerebral **(cortical)** lesions.
  - **Focal** small lesions in critical areas of **brainstem.**

➔ *Clinical grades of coma:*

1. *Grade I (stupor): بيصحى*
   Patient can be **aroused for a short period**, then becomes unconscious again.
2. *Grade II (light coma): moan*
   Patient can't be aroused but **responds to painful stimuli by moaning** or withdrawal movements (decorticate or decerebrate postures).
3. *Grade III (deep coma): بيتنفس*
   No response to painful stimuli, but still **breathing spontaneously.**
4. *Grade IV (deep coma with apnea): مش بيتنفس*
   - All brainstem functions are lost, with **apnea.**
   - Brain death (if not mechanically ventilated).

➔ *Level of consciousness (Glasgow Coma Scale "GCS"):*

Eye opening	Spontaneous (4) To voice (3) To pain (2) None (1)
Verbal response	Normal conversation (5) Disoriented conversation (4) Words, but not coherent (3) No words, only sounds (2) None (1)
Motor response	Normal (6)

	Localized to pain (5) Withdrawal to pain (4) Decorticate flexion (3) Decerebrate extension (2) None (1)

N.B.

A child with GCS below 9 indicates severe neurological damage.

➔ *Pathologic levels of coma:*

- **Intact brainstem reflexes** (light, corneal & oculo-cephalic) means a **cortical** lesion.
- **Lost or sluggish brainstem reflexes** means a **brainstem** lesion (worse).

➔ *Signs of increased intracranial tension:*

1. History of vomiting, headache, blurred vision.
2. Examination: hypertonia, hyperreflexia, hyperventilation, signs of herniation (systemic HTN & bradycardia), sluggish pupillary reflex.

➔ *Causes of coma:*

	Primary or structural	**Secondary or metabolic**
Lesion	Focal or lateralizing (except infection)	Diffuse
Causes	1. Head trauma. 2. CNS infection. 3. Vascular (infarction, hemorrhage). 4. Tumor. 5. Post-epileptic.	**1. Hypoxic encephalopathy:** - Respiratory failure. - Heart failure. - Shock. **2. Endogenous encephalopathy:** - Renal failure. - Liver cell failure. - DKA. - Acute hypertension. **3. Exogenous encephalopathy:** Exogenous poisons (organophosphorus compounds or drugs as paracetamol).
Diagnosis	CT scan & MRI.	Lab. investigations.
Response	Not dramatic, if any.	Responsive to treatment, if diagnosed early.

Mnemonic for causes of secondary coma:

٣ دروس قبل ال coma و ٣ دروس بعدها و poison

٣ دروس قبل ال coma

- Respiratory failure

- Heart failure

- Shock

الدروس اللي بعدها

- Renal failure

- Liver failure

- DKA

+ Poison

➔ *Clinical approach:*

1. *History:*

Ask about possible causes (toxins, trauma, …).

2. *Examination:*
   a. Vital signs.
   b. Glasgow coma scale (discuss).
   c. Signs of lateralization (unequal pupils, asymmetric reflexes, unilateral hypo or hypertonia, …).
   d. Signs of increased intracranial tension (discuss).
   e. Picture of the cause (trauma, jaundice…).
3. *Investigations:*

= Investigations of the cause

افتكر السبب و ألف مش لازم اللي في الكتاب

Urgent, for all:

a. **A**BG.
b. **B**lood sugar.
c. **B**lood gases.
d. **B**lood urea & creatinine.
e. **C**BC.

Optional:

a. Sepsis screening (ESR, CRP & blood culture).
b. Coagulation studies (PT, PTT and platelet count).
c. Metabolic screening.
d. Toxicological screening.
e. Lumbar puncture.
f. CSF examination.
g. Liver function test.
h. CT scan or MRI of brain.
i. Chest x-ray.

➔ *Management:*

1. *Non-specific neurological support:*
   a. ABC:
      - **A**irway: keep airway patent, keep in lateral position, suction of secretions.
      - **B**reathing: give oxygen, ventilation if needed.
      - **C**irculation: IV fluids, keep blood pressure.
   b. Control convulsions:
      - Specific: correct hypoglycemia and hypocalcemia.

- Nonspecific: diazepam and phenobarbitone.

c. Control of increased ICT:
- Semi-sitting position (head elevation 30°).
- Fluid restriction to 60% of requirements.
- Mannitol 20% 5-10 ml/kg over 20 minutes.
- IV furosemide.
- IV dexamethasone or methylprednisolone.
- Therapeutic hyperventilation (keep $PaCO_2$ 25-30 mmHg).

d. Support other systems:
- Respiratory care:
  Physiotherapy and suction.
- Keep patient warm.
- Nutritional care and GIT support:
  - Ryle feeds.
  - Antacids.
  - Enema.
  - Laxatives.
- Prevention of infection.
- Eye care to prevent exposure keratitis.
- Skin care to prevent bed sores.

2. *Treatment of underlying cause:*
   For example:
   a. Intracranial infection: antiviral or antibacterial drugs.
   b. DKA: IV fluids and insulin.
   c. Renal failure: dialysis.
   d. Poisoning: gastric lavage and specific antidote (if available).

---

8. Give the treatment plan of diabetic ketoacidosis.
How to diagnose and treat DKA.
Diabetic ketoacidosis (DKA)

➔ *Precipitating factors:*
1. Infections.
2. Insulin under dosage.
3. Trauma (physical or psychological).

➔ *Clinical picture:*
1. Polyuria.
2. Dehydration.
3. Fever.
4. Hypovolemia.
5. Acetone mouth odor.
6. Acidotic breathing (rapid and deep breathing).
7. Coma.

➔ *Complications:*

1. **Shock:**
   - Hypovolemic (polyuria and vomiting).
   - Septic (infection).
2. **Brain edema, due to:**
   - Rapid correction of hyper-osmolarity and hypovolemia.
   - Ischemic hypoxia (secondary to hypovolemia).
3. **Pulmonary edema:**
   - Hyper-osmolarity.
   - Myocardial heart failure (secondary to acidosis).
4. **Cardiac arrhythmia:**
   - Hyperkalemia.
   - Hypocalcemia.

➔ *Lab findings:*

1. **Cardinal lab findings:**
   - Hyperglycemia (> 300 mg/dl).
   - Ketonemia.
   - Metabolic acidosis (pH < 7.3, HCO_3 < 15 mEq/L).
2. **Glucosuria and ketonuria.**
3. **Other variable lab findings:**
   - Serum K^+: normal, increased or decreased (N: 3.5-5.5 mEq/L).
   - Serum Na^+: dilutional hyponatremia (N: 135-145 mEq/L).
   - Serum PO_4: normal, increased or decreased (N: 3-5.5 mg/dl).

➔ *Management of DKA:*

i. Fluid management in the 1st 24-36 hours:

Amount = sum of deficit and maintenance.

Maintenance:

According to body weight:

First 10 kg of body weight:	100 ml/kg/24 hrs.
For each kg from 11-20 kg:	50 ml/kg/24 hrs.
For each kg above 20 kg:	20 ml/kg/24 hrs.

Deficit:

According to degree of dehydration (usually between 50-100 ml/kg).

Solution will be divided like this:

Duration	1st hour	2nd hour	Next 10 hours	Next 24 hours
Amount	10%	10%	40%	40%
Fluid	Normal saline	0.45% saline KCl 20 mEq/L	0.45% saline K phosphate 30 mEq/L	0.45% saline K phosphate 40 mEq/L

ii. Insulin therapy in ketoacidosis phase:

- Regular insulin bolus 0.1 unit/kg IV.
- Regular IV infusion of 0.1 unit/kg/hour.
- When blood glucose drops to 250 mg/dl:

- Add glucose 5% to IV fluids.
- Reduce insulin by 50% to 0.05 unit/kg/hour IV infusion.

- Assessment for metabolic acidosis:
  - If controlled: shift to SC route (0.2-0.4 unit/kg/6 hrs).
  - If persists: check for other causes of metabolic acidosis (e.g. sepsis, hypoxia, renal failure).

By now, the patient should be:

- No **a**cidosis.
- **B**lood sugar < 200 mg/dl.
- **C**onscious.
- Not **de**hydrated.
- Ready for oral **f**eeding.

iii. Alkali therapy (only in selected patients):

➔ *Severe acidosis can lead to:*

1. Peripheral vasodilation, leading to hypotension.
2. Weak myocardial contractility.
3. Respiratory depression.

– Increased resistance to insulin.

IV fluids and insulin alone usually correct most cases of acidosis.

– Alkali therapy may result in alkalosis that has its own hazards

➔ *Indications:*

- Only when pH is 7.1 or less.
- Cut-off level is controversial.
- Many endocrinologists do not use alkali even when pH is 7.

➔ *Available $NaHCO_3$ solutions:*

- 8.4% solution: 1 mEq/ml.
- 5% solution: 0.6 mEq/ml.

➔ *Fast correction dose:*

- 2 mEq/kg IV drip over 30 minutes.
- Repeat ABG in 30 minutes.
- Repeat $NaHCO_3$ if needed.

➔ *Precautions:*

- Never give $NaHCO_3$ as IV bolus (cardiac arrhythmias).
- Cooperation between diabetes specialists and ICU staff is mandatory.

---

9. Anaphylaxis.

➔ *Definition:*

Acute systemic potentially life-threatening inflammatory reaction, following exposure to specific trigger (severe type-1 hypersensitivity reaction).

➔ *Pathogenesis:*

Type 1 hypersensitivity reaction:

- Trigger: antigen.
- Response: IgE-mediated mast cell activation.

➔ *Triggers:*

1. **Diet:**
   - **M**ilk, **E**ggs, **W**heat & **S**oy (MEWS) are the most common food allergens.
   - Peanuts and fish are among the most potent.
2. **Drugs.**
3. **Insect venom.**
4. **Environmental allergens:**
   - Pollens.
   - Mites.
   - Molds.

➔ *Clinical picture:*

"Maybe part of another question (see allergy chapter)"

1. Allergic conjunctivitis.
2. Allergic rhinitis.
3. Oral itching and edema of lips, tongue or palate.
4. Respiratory:
   Dysphagia, hoarseness, stridor, dyspnea, repetitive cough & wheezes.
5. CVS:
   Chest pain, palpitations & hypotension.
6. GIT:
   Nausea, colic, cramps, vomiting & diarrhea.
7. Skin:
   Hotness, flushing (wheals), urticaria & edema.
8. Finally, shock (discuss clinical picture).

➔ *Management:*

1. **ABC:**
   a. **A**irway: keep airway patent, keep in lateral position, suction of secretions.
   b. **B**reathing: give 100% oxygen, ventilation if needed.
   c. **C**irculation: IV fluids, keep blood pressure.
2. **D**rugs:
   a. Epinephrine 0.01 ml/kg **IM.**
   b. Salbutamol by nebulizer.
   c. Antihistaminic: H_1 receptor antagonist (diphenhydramine).
   d. Anti-inflammatory: corticosteroids (IV hydrocortisone).
   e. Treatment of shock:
      – Trendelenburg position.
      – 20 ml/kg ringer or saline.

(Discuss all management of shock)

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10. Discuss management of oliguria.

See nephrology chapter.

OTHER TOPICS:

1. Emergency approach.

➔ *Definition:*

Five successful **steps** that should be done rapidly (5 minutes with trained hands), replacing the traditional medical steps.

1. *Primary survey:* ***(check these items rapidly)***

ABCDE

- **A**irway: patent or not.
- **B**reathing: breathing or not.
- **C**irculation: heart is beating or not.
- **D**isability: patient is conscious or not.
- **E**xposure: uncover the patient to look for injuries or bleeding.

2. *Cardio-pulmonary resuscitation (CPR):*

Made for those with cardiopulmonary arrest or near arrest.

A. Basic life support (A+B+C):

a. **A**irway:
   - Open.
   - Remove any FB.
   - Clear and maintain airway.

b. **B**reathing:

Assisted ventilation:
   - Mouth to mouth.
   - Bag and mask.

c. **C**irculation:
   - Chest compressions.
   - IV fluids.

B. Advanced life support:

d. **D**rugs:
   - Mainly adrenaline.
   - 1/10.000 dilution (0.1 ml/kg/IV), maybe repeated. Or (0.3 ml/kg endotracheal).

e. **E**CG:

To determine type of arrhythmia.

f. De**F**ibrillation, if needed.

3. *Secondary survey* ***(to detect system failure):***

A. Respiratory failure:
- Type 1 failure: respiratory distress due to severe airway or lung pathology.
- Type 2 failure: respiratory depression due to coma or respiratory muscle paralysis.

B. Cardiovascular failure:
- Heart failure: tachycardia, tachypnea and tender liver.
- Circulatory failure (shock): poor peripheral perfusion, tachycardia and hypotension.

C. Neurologic failure:
- Convulsions: repetitive involuntary muscle contractions.

- Coma: unresponsiveness to painful stimuli.

D. Metabolic failure:

- Hypothermia: body temperature below 35ºC.
- Dehydration: sunken eyes, dry tongue and lost skin turgor.
- Acid-base and electrolyte imbalance: esp. metabolic acidosis.

E. Organ failure:

- Acute renal failure.
- Acute liver failure.
- Diabetic ketoacidosis.

F. Hematologic failure:

- Acute hemolytic anemia: acute intense pallor with tachycardia and jaundice.
- Bleeding: look for bleeding sites (uncover hidden areas).

4. Definitive care:

A. Respiratory support:

- Oxygen therapy.
- Suctioning.
- Positive pressure support.

B. Cardiovascular support:

- Oxygen therapy.
- IV fluids.
- Inotropic support.

C. Neurologic support:

- ABC.
- Convulsions control.
- Reduction of intracranial tension.

D. Metabolic support:

- Correction of temperature.
- Maintenance of hydration & organ functions.

E. Hematologic support:

- Urgent transfusion.
- Control of bleeding.

F. Specific treatment of the cause.

5. Monitoring:

a. Clinical:
Vital signs.

b. Laboratory:
Recording lab changes.

c. ICU monitor.

---

2. Management of respiratory failure.

i. Respiratory monitoring:

1. Clinical monitoring:

- Respiratory rate, heart rate & blood pressure.

- Degree of respiratory distress.
- Color of the patient.
- Peripheral perfusion (as capillary refill time).
- Chest signs.

2. Oxygen saturation (SaO_2):

Device:

Pulse oximeter.

Advantages:

a. Simple.
b. Reliable.
c. Non-invasive.

Disadvantages:

a. Can't measure hyper-oxygenation.
b. False reading in:
   - Shock.
   - Very dark skin.
   - Methemoglobinemia.

Interpretation:

- > 95%: normal.
- 90-95%: mild hypoxia.
- 85-90%: moderate hypoxia.
- < 85%: severe hypoxia.

3. Arterial blood gases (ABG):

Advantages:

a. Assessment of oxygenation (PaO_2) & hyperoxygenation.
b. Assessment of ventilation (CO_2 elimination).
c. Assessment of acid-base balance.

Disadvantages:

a. Invasive.
b. Painful.
c. Expensive.
d. Needs ICU.

Normal values:

- PaO_2: 90-100 mmHg.
- $PaCO_2$: 35-45 mmHg.
- pH: 7.35-7.45.
- HCO_3: 22-26 mEq/L.

In practical book: 20-24 mEq/L.

General principles:

- **Arterial** ABG can assess ventilation, acid-base balance & oxygenation.
- **Venous** ABG can assess ventilation, acid-base balance, but **not oxygenation.**
- ABG should be interpreted in relation to clinical findings:
  - Normal ventilation can occur with severe distress.

– Normal oxygenation with oxygen therapy.

Assessment of blood gas report:

a. State of oxygenation:

PaO_2	**Interpretation**
90-100 mmHg.	Normal.
Above 100 mmHg.	Oxygen therapy or air in sample.
Below 70 mmHg.	Hypoxia (needs oxygen therapy).
Below 50 mmHg.	Hypoxic respiratory failure (needs PPV).
Below 35 mmHg.	Central cyanosis.

In VBG: never comment on state of oxygenation (markedly variable).

b. State of ventilation:

$PaCO_2$	**Interpretation**
35-45 mmHg.	Normal.
Below 30 mmHg.	Hyperventilation.
Above 50 mmHg.	Hypoventilation.
Above 60 mmHg.	Severe hypoventilation.

c. State of acid-base balance:

Acidosis (pH < 7.35)	**Alkalosis (pH > 7.45)**
↑ PCO_2 = respiratory	↓ PCO_2 = respiratory
↓ HCO_3 = metabolic	↑ HCO_3 = metabolic

Causes: see practical book.

ii. Respiratory support:

A. Oxygen therapy:

➔ *Indications:*

1. Hypoxic respiratory failure.
2. Potential hypoxia (respiratory distress).
3. Circulatory failure (shock).
4. Neurological failure (deep coma).

➔ *Oxygen source:*

1. Wall oxygen source.
2. Oxygen cylinders.
3. Oxygen concentrator.

➔ *Methods of administration:*

1. Incubators.
2. Simple face mask.
3. Venturi mask.
4. Head box.
5. Nasal prongs.
6. Endotracheal tube.

➔ *Precautions:*

1. Oxygen should be humid and warm.
2. Keep on the least possible FiO_2 (fraction of inspired O_2).
3. Stop oxygen when not indicated.

N.B. Currently, FiO_2 is used instead of O_2 concentration.

➔ *Dose of oxygen:*

- Use the minimum FiO_2 that can achieve acceptable PaO_2.
- It is not necessary to reach normal PaO_2.
- Start with 100% oxygen only in presence of cyanosis (otherwise, start with 40-60%).
- Readjust the dose according to response.

➔ *Assessment of response:*

1. Clinically:
   - Color of the patient.
   - Degree of respiratory distress.
2. Pulse oximeter:
   Increase in SaO_2.
3. ABG:
   Increase in PaO_2.

➔ *Complications of oxygen therapy:*

1. Eye toxicity:
   Retinopathy of prematurity (ROP).
2. Lung toxicity:
   - Destruction of pneumocytes; leading to decreased surfactant production.
   - Broncho-pulmonary dysplasia (BPD).
3. Oxygen dependency (difficult weaning).

B. Positive pressure ventilation (PPV)

I. Manual positive pressure ventilation

➔ *Indications:*

1. During CPR.
2. During physiotherapy and suction.
3. During patient transport.

➔ *Technique:*

1. Bag and mask.
2. Bag and tube.

➔ *Types of bags:*

1. Self-inflating bag (Ambu bag):

A. Advantages:

- Easy to use.
- Give 40% O_2 and 100% O_2 with reservoir.
- Pressure release (safety pop-off) valve makes over-inflation less likely.

B. Disadvantages:

- It will inflate even if there is not a good seal between the mask and patient's face.
- Requires reservoir to deliver 100% oxygen (only 40% without reservoir).
- Can't be used as a device for free flow of oxygen.

2. Flow-inflating bag (anesthesia bag/Jackson-Rees bag):

a. Advantages:

- Delivers 100% O_2 at all times.

- Easy to determine when there is a good seal on the patient's face.
- Stiffness of the lung can be felt.
- <u>Can be used to deliver free flow 100% oxygen:</u>

  Once oxygen enters the bag, it is not diluted (same concentration of oxygen that enters the bag is delivered to the patient).

b. <u>*Disadvantages:*</u>

- Requires a tight seal between the mask and the patient's face.
- Requires a gas source to inflate.
- Usually does not have a safety pop-off valve.

II. Mechanical positive pressure ventilation

➔ *Indications:*

1. Apnea not responding to simple measures.
2. Hypoxia not responding to simple measures.
3. Hypercapnia not responding to simple measures.
4. <u>Supportive, after:</u>
   a. CPR.
   b. Major **S**urgery.
   c. **S**hock.
   d. **S**tatus epilepticus.
5. Therapeutic hyperventilation to reduce intracranial tension.

➔ *Parts of the ventilator system:*

1. Oxygen source.
2. Oxygen blender.
3. Ventilator.
4. Humidifier.
5. Patient breathing circuit.

➔ *Modes of support:*

1. Continuous positive airway pressure (CPAP).
2. Intermittent mandatory ventilation (IMV).
3. Controlled mechanical ventilation (CMV).
4. High-frequency ventilation (rate between 300-600).

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3. Septicemia.

➔ *Definition:*

- Bacteria and their toxins in the circulation.
- The condition is associated with release of inflammatory cytokines leading to severe inflammatory response.

➔ *Causes:*

1. **<u>Gram negative bacteria:</u>**
   a. Meningococci (**most common**).
   b. Hemophilus influenzae.
   c. E. coli.
   d. Klebsiella.

2. **Gram positive bacteria:**
   Streptococci (group B in neonates).

➔ *Source:*

Usually secondary to focal infection (e.g. meningitis).

➔ *Clinical picture:*

1. **History of focal infection:**
   a. Osteomyelitis.
   b. Arthritis.
   c. Pyelonephritis, ... etc.
2. **Examination:**
   a. Hyperpyrexia, anorexia, vomiting, drowsiness and poor general condition.
   b. Septic shock:
      - Signs of poor perfusion (discuss as in shock).
      - Signs of multiple organ system failure (discuss).
   c. Picture of the cause:
      e.g. Purpura fulminans in meningitis.

➔ *Complications of advanced septicemia:*

1. **Serious focal infections:**
   a. Meningitis.
   b. Pneumonia.
   c. Osteomyelitis.
   d. Arthritis.
2. **Sclerema (skin hardening):**
   Fatal complication in neonates.
3. **Toxic encephalopathy:**
   a. Disturbed consciousness.
   b. Convulsions.

➔ *Investigations:*

1. **CBC with differential:**
   a. Leukocytosis (> 15.000-30.000/mm^3).
   b. Bandemia (band cells > 15%).
   c. Toxic granulations.
2. **Acute phase reactants:**
   a. Elevated ESR.
   b. Elevated CRP (between 20-30 mg/L).
3. **Cultures:**
   a. Blood culture.
   b. Urine culture.
   c. CSF analysis and culture.
4. **Throat & umbilical swabs to detect the focus.**

➔ *Treatment:*

1. **Monitoring.**
2. **Cardiovascular and respiratory system support (ABC).**

Discuss as before.

3. **<u>Treatment of the cause:</u>**

   <u>Combined parenteral antibiotics:</u>

   Broad spectrum penicillin (as ampicillin 100 mg/kg/day) + an aminoglycoside (as gentamicin 4-6 mg/kg/day).

4. **<u>Early management of complications.</u>**

---

4. Status epilepticus.

➔ *Definition:*

- Convulsive fits lasting <u>more than **30 minutes**</u>.

<u>Or:</u>

- Short repetitive fits without re-gaining consciousness in between.

➔ *Causes:*

1. Status epilepticus in epileptic child.
2. <u>Acute CNS insult:</u>
   a. CNS infection.
   b. Intracranial hemorrhage.
   c. Hypoxic encephalopathy.
   d. Metabolic encephalopathy.
3. Prolonged febrile convulsions.

➔ *Complications:*

1. **<u>Respiratory:</u>**
   a. **A**pnea.
   b. **A**spiration.
   c. **A**irway obstruction.
   d. Pulmonary edema.
2. **<u>Cardiovascular:</u>**
   a. Shock.
   b. Heart failure.
   c. Arrest.
3. **<u>Metabolic:</u>**
   a. **Hypo**glycemia.
   b. **Hypo**natremia.
   c. **Hyper**pyrexia.
   d. Metabolic acidosis.
4. **<u>Neurological:</u>**
   a. Brain edema.
   b. Brain ischemia.
   c. Brain hemorrhage.
   d. Brain damage.

➔ *Management:*

1. **<u>ABC:</u>**

   Discuss as before.

2. **Drugs:**
    - 1st line: Diazepam 0.5 mg/kg slowly IV.
    - If not controlled in 10 minutes: Phenobarbital 15-20 mg/kg slow IV.
    - If not controlled: Phenytoin 15-20 mg/kg slow IV.
    - If not controlled: refer to ICU.
3. **Management of refractory cases:**
    - 1st line: midazolam or diazepam (continuous infusion).
    - 2nd line: paraldehyde – lidocaine – thiopental.
    - Usually require mechanical ventilation.

---

5. Acute hepatic failure = Acute liver cell failure = Acute fulminant hepatitis.

➔ *Definition:*

- Sudden failure of the liver to do its functions (metabolic, excretory and detoxifying).
- Very serious, with bad prognosis and high mortality.

➔ *Causes:*

1. **Infections (viral hepatitis):**
    - Hepatitis viruses A, B, D.
    - Others: EBV, CMV.
2. **Metabolic:**
    - Wilson's disease.
    - Tyrosinemia.
3. **Toxins/drugs:**
    - Paracetamol.
    - NSAIDs.
    - Erythromycin.
    - Isoniazid.
    - Halothane.
4. **Autoimmune hepatitis.**
5. **Reye syndrome:**
   Aspirin + varicella or flu.

➔ *Pathophysiology:*

1. **Disturbed hepatic metabolic functions:**
    - **Hypo**albuminemia**.**
    - **Hypo**glycemia**.**
    - **Hypo**natremia & **hypo**kalemia**.**
    - Decreased synthesis of coagulation factors.
    - Retention of some **amino acids and short chain fatty acids**.
    - Metabolic **acidosis.**
2. **Disturbed hepatic excretory functions:**
    - Elevated serum bilirubin (except in Reye syndrome).
    - Elevated serum bile salts.
3. **Disturbed hepatic detoxifying functions:**
   Elevated blood ammonia level.

➔ *Clinical picture:*

1. Progressive **jaundice** (except in Reye syndrome).
2. Easy **bruising and bleeding** tendency (mainly **GI** bleeding).
3. Persistent **vomiting**.
4. Disturbed level of **consciousness** (hepatic encephalopathy):
   - Secondary bacterial infections.
   - Brain edema.
5. **Renal** failure (hepato-renal syndrome).
6. **Respiratory** failure.

➔ *Lab findings:*

1. Elevated serum transferases: AST (SGOT) & ALT (SGPT).
2. Elevated serum bilirubin (except in early stage and Reye syndrome).
3. Elevated blood ammonia.
4. Prolonged prothrombin time.
5. Low serum albumin.
6. Hypoglycemia.
7. Hyponatremia & hypokalemia.
8. Metabolic acidosis.

➔ *Management:*

1. *Close monitoring:*
   a. **Clinical:**
      - Vital signs.
      - Level of consciousness (LOC).
      - Urine output, edema, ascites.
      - Signs of brain edema.
      - Bleeding.
      - Evidence of infection.
   b. **Lab monitoring:**
      - Liver functions.
      - Renal functions.
      - Blood sugar.
      - Blood ammonia.
      - Blood sugar.
      - Serum electrolytes.
      - Prothrombin time.
2. *Conservative measures:*
   a. **Homeostasis of water, electrolytes, glucose, albumin and nutrition:**
      - IV fluids.
      - IV salt-free albumin.
      - Feeding:
        - Oral.
        - Nasogastric.
        - Total parenteral nutrition (TPN).

- Reduction of blood ammonia:
  - Reduce protein intake.
  - Neomycin.
  - Lactulose.
- Control bleeding:
  - Fresh frozen plasma.
  - Fresh blood transfusion.
  - IV vitamin K.
  - Antacids.

b. Control infections:

- Antibiotics (guided by culture).

c. Correction of fluid retention and ascites:

- Fluid restriction, with or without diuretics.

d. Treatment of brain edema:

- Head elevation.
- IV drip mannitol.
- Therapeutic hyperventilation.

3. *Drastic measures:*

a. Charcoal hemoperfusion.

b. Liver transplantation.

فيه رسمة حلوة في كتاب د. إسماعيل

Neonatology

ESSAY QUESTIONS: (EXAMS)

1. **Describe normal neonatal reflexes and their clinical significance.**

➔ *Value of neonatal reflexes:*

Evaluation of the general condition, and evaluation of vision, and detection of focal neurological signs.

➔ *Classification:*

1. Tendon reflexes.

2. Primitive reflexes:

- They are peculiar to new born and dis appears by 4-6 month when the cortex maturates.

- They are mediated by brain stem, and any persistence of these reflexes indicates "cortical damage".

➔ *Reflexes: -*

2 in the head and neck

1. Moro`s reflex:

Stimulus: Dropping the head, with supporting the shoulders by examiner`s hand

- Or making loud noise near to the baby`s ear
- Or sudden withdrawal of the blankets from underneath the infant.

Response: Abduction of arm, extension of the forearm and fanning of the fingers.

- Associated with extension of the trunk.
- Then the arms clinched, and the cry may follow it.

Appears at birth and disappears at 4-6 months.

Clinical significance:

- Alosence denotes: - birth injury, cerebral depression (narcotics), anesthesia given to the mother just before delivery, or prematurity.
- Assay metrical response: - Erb`s palsy or fracture clavicle.
- Persistence after 6 months: - cerebral or mental retardation.

2. Tonic neck reflex:

Stimulus: placing the infant in supine position, with later rotation of the head to one side.

Response:

Extension of ipsilateral arm and leg, and flexion of the limbs on the opposite side.

Time: obtained from 1-6 months.

Clinical significance:

- Abnormal response: denotes "neuronal disorder of cerebral origin".
- Persistence → cerebral disease is a possibility.

2 in the eye

3. Blinking:

Stimulus: sudden exposure of the eyes to bright light

Response: blinking.

4. Pupillary light reflex:

Stimulus: Exposure to bright light

Response: pupillary constriction.

Both are present **since birth** and **don`t disappear,** and they are important for evaluation of vision.

2 in the mouth

5. Rooting:

Stimulus: Let the nipple or tip of a finger touches the angle of mouth

Response: The mouth opens, and head turns towards side of the stimulus.

6. Sucking reflex:

Stimulus: Introducing the nipple or a finger in infant`s mouth.

Response: The sucks it.

Significance: Absence of this reflex indicates serious brain lesion or serious infection.

2 in the lower limb

7. Stepping reflex:

Stimulus: Holding the infant in upright position and sole of feet touches the table.

Response: Stepping movements.

8. Placing reflex:

Stimulus: when the dorsal surface of the foot touches the edge of table.

Response: the foot is elevated and placed on the table.

9. Babinski's reflex:

Stimulus: - firmly stroking the sole of foot.

Response: - dorsiflexion of the big toe, and fanning of the other toes.

Time: usually disappears of 1 year, but sometimes it persists another year.

Clinical significance: presence in above 2 years → may indicates UMNL "spastic cerebral palsy"

1 in the hand

10. Grasp reflex:

Stimulus: putting your finger or an object in infant`s hand.

Response: grasping and holding the object.

Time: present of birth, disappears after 4 months.

Clinical significance:

- Unilateral absence → focal neurological lesion
- Persistence → indicates UMNL "cerebral palsy".

1 in the body

11. Landau reflex:

Stimulus: when infant is held prone in horizontal position.

Response: the body form a convex arch up words with head, trunk and hips flexed and shoulders drawn back.

Timing: appears at 3 months, disappears at 9-12 months

Clinical significance:

- appears at 3 months, disappears at 9-12 months

- Delayed appearance → mental retardation or cerebral palsy.

---

2. Describe Rooting and Suckling reflex in new born.

1. Rooting:

Stimulus: let the nipple or tip of a finger touches the angle of mouth

Response: the mouth opens, and head turns towards side of the stimulus.

2. Sucking reflex:

Stimulus: Introducing the nipple or a finger in infant`s mouth.

Response: the infant sucks it.

Significance: Absence of this reflex indicates serious brain lesion or serious infection.

Checking the femoral pulse is essential during examination of every new born.

- It`s best in neonates.
- To exclude coarctation of aorta, as in coarctation there is weak or absent femoral pulse, and radio – femoral delay.

Presence of vernix caseosa.

1. Protect against amniotic fluid and insulation.
2. Facilitate delivery.

---

3. Discuss vascular abnormalities that present in newborn

1. Nevus simplex:

- Its flat pink macular lesion "salmon patch “found on forehead and upper eyelid.
- its formed by distended dermal capillaries.
- it resolves by 1 year of age.

2. nevus flammeus:

- its flat mildly elevated reddish-purple lesion " port-wine stain "that appears mostly in the face.
- associated with underlying hemangiomas in the region of first branch of trigeminal nerve
- may be associated with cortical lesion (sturge weber syndrome)

3. cavernous hemangioma:

- Its Deep strawberry hemangioma that lead to thrombocytopenia
- Treatment; may involve surgical occlusion, laser or steroids.

N.B: Erythema toxicum is not vascular anomaly, and it fade by 1 week of ttt

---

4. Steps for proper resuscitation prior to delivery, post-delivery (sept 2017)

Resuscitation is applied to neonates who fail to have regular respiration

→ *Prior to delivery:*

1. Anticipate problems: history (maternal risk factors, expected delivery problems)
2. Adequate personal: trained personal (2 in healthy delivery, 3 if not healthy)
3. Adequate equipment: the following equipment should be available.

- Radiant warner heated: and ready for use.
- Suction equipment (Suction machine, meconium aspiration)
- Oxygen delivery equipment (bag and different sizes masks, airways)
- Intubation equipment (laryngoscope, tubes different sizes)
- Stethoscope, umbilical catheter tray and syringes.

4. Medication: epinephrine, volume expanders, NaCO3 and naloxone.

→*Post-delivery resuscitation:*

Initial assessment: Ask 3 questions:

- Was he born at term?
- Does he take breath or cry?
- Have a good tone?

If Yes? The baby should stay with mother.
If any is No? Resuscitation.

→ *Post Natal Resuscitation:*

1. Airways:

Warmth (radiant warmer) and drying.
Open airways.
proper position: On the back - Neck slightly extended – Use shoulder roll.
Suction:
Mouth first then nose (avoid deep oral suction to avoid vagal stimulation)
Re-evaluate: (color – breathing – circulation) in 15 to 30 seconds

- If not breathing or gasping: proceed to B.
- If HR below 100 beats/min: proceed to B.
- If cyanosis with normal HR and respiration: Only free flow O2.

2. Initiate breathing:

Device: self-inflating bag (Ambu-bag) or flow inflating bag.
Methods:

- Connect to oxygen source and connect a reservoir (100% oxygen)
- Choose the size of the mask (covering mouth, Nose and not eyes)
- Recheck the position of the body (slight extension of neck)
- Start ventilation at orate of 60 breath/min.
- Re-evaluate after 15-30 seconds HR
- If not improving: recheck oxygen source, the bag, mask seal, position of the baby and secretion.
- If HR:
  . Above 100: stop PPV and assess.
  . 60-100: continue PPV.
  . Below 6: continue PPV and start chest compression.

3. Chest Compression:

→ **Definition**:

rhythmic compression of the sternum that compress heart against the spine, allowing blood to circulate to vital organs.

→ **Indication**: if HR < 60 inspite of 30 seconds of PPV

→ **Technique**:

- Leader should first insert endotracheal tube and connect to O2 source.

- Place the baby on firm surface.
- Two methods:

  - Thumb technique: using 2 thumbs of both hands to depress the lower 1/3 of sternum while the hands encircle.
  - Two finger technique: with tips of index and middle finger of one hand to compress the sternum, other hand support baby's back.
  - Depth of compression: one third of antero-posterior diameter of the chest, and then release pressure to allow heart to refill.
  - Rate: One ventilation every third compression (1 and 2 and 3 and breath)
  - Continue till the HR > 60 bpm.
  - Then continue PPV at rate of 60 breath/min. till HR > 100,
  - If not responding start medication. (epinephrine – volume expanders, NaHCO3, Naloxone hydrochloride)

→ **Medications**:

Indication: HR<60bpm with adequate ventilation & cardiac compression.
Route: I.V – endotracheal tube – intraosseous.
Drugs:

1. Epinephrine: 0.3 ml/kg of a 1:10000 solution
   for the endotracheal administration the dose is 0.5-1 ml/kg.
   - Increases HR and BP.

2. Volume expanders: 10m/kg over 5-10 mins.
   - Improve perfusion > reduce metabolic acidosis.
   - Saline/ ringer lactate or blood.

3. Sodium bicarb: 1-2m eq IV slowly.
   - Indicated if prolonged cardiac arrest.
   - Improve metabolic acidosis.
4. Naloxone Hydrochloride
   - Narcotic antagonist.
   - Indicated if resp.depression due to maternal narcotic intake.

---

5. Give an account on Endotracheal intubation:

➔ *Indication:*

1. Suction of meconium.
2. Surfactant administration.
3. Ventilation exceeds 5 min.
4. If chest compressions are necessary.
5. Drug administration

➔ *Equipment and supplies needed:*

- Laryngoscope and blades.
- Endotracheal tube with different sizes.
- Stylet suction setup.
- Waterproof tape and scissors.
- Stethoscope.
- Positive pressure device: ambu bag.

- Oxygen source.
- Pulse oximeter.

➔ *Procedure:*

- Sterilization.
- Slightly extended neck.
- Stand at head of infant.
- Hold laryngoscope with left hand.
- Stabilize head of infant with right hand.
- Slide the blade of laryngoscope over right side of tongue.
- Push tongue to left side of the mouth.
- Advance the blade till the tips lies in the vallecula.
- Once there, lift the blade slightly to move the tongue out of the way and exposing the pharynx.
- Assess landmarks, the glottis should be apparent with vocal cords on either side as an interval V.
- Hold ETT on right hand.
- Introduce it to right side of the mouth.
- Insert tube between the vocal cords.
- Confirm equal air entry by ambu bag and stethoscope.
- If unsuccessful: resume PPV with bag and mask.

---

6. List characteristics features and complications of preterm babies (sept 2011)

➔ *Characteristics features*

1. Low birth weight, short stature, small head.
2. Closed eyelids with infrequent eye movement.
3. Under developed ear with poor recoil.
4. Skin very shiny red, thin.
5. Plenty of lanugo hair on shoulder, back and face, fine scalp hair.
6. Nipple is absent, No breast nodule.
7. Female: prominent labia minora and clitoris.
8. Male: smooth small scrotum with undescended testis.
9. Hypotonia, absent sole creases.

➔ *Complication:*

1. Respiratory: apnea of prematurity, Respiratory distress syndrome, recurrent aspiration and bronchopulmonary dysplasia due to prolonged ventilation.
2. Neurological: Intra-cranial hemorrhage, kernicterus, periventricular leucomalacia.
3. GIT: Poor sucking, Excess GERD and vomiting, Necrotizing enterocolitis.

Necrotizing enterocolitis:

Incidence: affect 10% of preterm infants < 1500 gm especially with birth asphyxia.
Pathogenesis: intestinal ischemia, bacterial or viral infection
Clinical Picture: abdominal distension, bilious vomiting, bloody stool.
Investigations:

- Lab: increased WBC's and decreased platelets, metabolic acidosis.
- X-ray: ileus, pneumatosis "air in bowel wall"

Complication: DIC, shock, high mortality, later on short bowel syndrome.

Treatment:

- Stop all enteral feeding.
- Correct perfusion: give IV fluids.
- Broad spectrum antibiotic coverage "ampicillin, third generation cephalosporin and coverage for anaerobes"

4. Hematological: anemia of prematurity.

5. Sepsis: due to immature immune system.

6. Metabolic: Hypoglycemia, Hypo-calcemia, Hypothermia, Hyper-bilirubinemia.

7. Retinopathy of prematurity:

Risk factor: extremely low birth weight.
Pathogenesis: O2 in preterm can induce abnormal peripheral retinal vascularization progress from stage I (incomplete vascularization) to stage V (sever vascularization, retinal detachment and blindness)
Treatment: screening by ophthalmology → Laser therapy.
Prognosis: Markedly improved with improved facilities NICU as mechanical ventilation, Total parenteral nutrition.

---

7. Enumerate causes of neonatal convulsions (September 2011).

A. Perinatal complications:

1. Hypoxic ischemic encephalopathy (commonest cause).
2. Cerebral contusion.
3. Neonatal encephalopathy.
4. Intracranial hemorrhage.

B. Metabolic:

1. Hypoglycemia.
2. Hypocalcemia.
3. Hypomagnesia.
4. Hyponatremia or Hypernatremia.
5. Disorders of metabolism: amino acids/carbohydrates (galactosemia).

C. Infectious:

1. Bacterial: meningitis, brain abscess.
2. Viral: CMV, Rubella, ECHO. (TORCH)

D. Developmental:

1. Neurocutaneous syndrome.
2. Sturge-Weber syndrome.
3. Tuberous sclerosis.

E. Drugs:

1. Maternal local anesthesia.
2. Narcotic withdrawal.
3. Theophylline & anti-histaminics.

F. Polycythemia/Hyperviscosity.

G. Focal cerebral infarcts:

1. Vascular occlusion.
2. Deficiency of protein C or S.
3. Maternal lupus.

H. Hypertensive encephalopathy.

I. Unknown (20%).

---

8. Discuss etiology, patterns & DD of neonatal seizures.

➔ *Etiology:* See before.

➔ *Patterns:*

A. Tonic:

- Mimic decelerate/decorticate posturing.
- Sustained posture of limbs/trunk.
- Only 30% show EEG abnormalities.

B. Myoclonic:

- Rapid isolated muscle jerking.

C. Clonic:

- One limb or side jerking rhythmic at 1-4 times/second rate.

D. Subtle:

- Eye: staring, deviation, blinking.
- Buccal/lingual: chew, suck, lip smacking.
- Limbs: cycling, row, swim.
- Systemic: apnea, BP alterations.

➔ *DD:*

A. Jitteriness:

- No associated eye motions.
- Stimulated by sudden movement or noise.
- Symmetrical rapid movement of hand.

B. Bilateral neonatal sleep myoclonus:

- Bilateral/unilateral jerking.
- No stimulus.
- Occurs during sleep.
- Involve trunk.

---

9. Differentiate between physiological & pathological jaundice in a full-term baby.

Physiological jaundice	***Pathological jaundice***
Transient serum bilirubin elevation.	Prolonged serum bilirubin elevation.
Unconjugated.	Conjugated + unconjugated.
++ RBCs volume/kg. Short life span (90 days). -- Uptake of bilirubin by liver (-- protein Y). -- Conjugation.	All causes of cholestasis (discuss from hepatology). Causes of unconjugated hyperbilirubinemia (see later).

2nd-3rd day.	Any.
Never exceed 15 mg/dl/day	Exceeds 15mg/dl/day
Max rate of Rise < 5 mg/dl/day.	Max rate of Rise > 5 mg/dl/day.
Last 1 week.	Last more than 2 weeks.

---

10. Discuss causes of neonatal hyperbilirubinemia & list differences between physiological & pathological jaundice.

➔ *Differences:*

See before.

A. *Physiological jaundice:* لازم تذكرها
- Occurs in 1st week dt. -- liver uptake, -- liver conjugation.

B. *Pathological jaundice:*
- ↑ *destruction due to:*
  - Polycythemia.
  - Hemolytic diseases (Rh & ABO incompatibility): تتشرح كاملة (متلخصة قدام عشان اللخبطة)
  - Hemolytic anemia (as G6PD deficiency).
  - Infections as septicemia/TORCH.
  - Extravasated blood: large cephalhematoma.
- *Liver-related:*
  - ↓ Uptake defect of Y&Z ptns : Gilbert disease.
  - ↓ Conjugation defect enzyme (glucuronyl transferase):
    - Enzyme suppression: e.g. cretinism/breast milk.
    - Gilbert disease.
    - Criggler-Najjar syndrome type I: AD "low amount of enzyme".
    - Criggler-Najjar syndrome type II: AR "no enzyme, incompatible with life".
- ↑*Enterohepatic circulation:*
- Bowel obstruction.
- Pyloric stenosis.
- Breast feeding jaundice.

NB:

Rh incompatibility:
- People are Rh^+ or Rh^-.
- Antibodies produced on exposure "sensitization", e.g. if mother is Rh^- & fetus is Rh^+, 1 ml of blood mix may occur at pregnancy or abortion.
- In 2nd infant, antibodies cross placenta causing haemolytic anemia of fetus.
- Symptoms severity is variable from only mild hemolysis "anemia & jaundice" to heart failure, generalized edema "hydrops fetalis".

ABO incompatibility:
- Antigens against ABO are naturally occurring.
- If mother is O and fetus is A, B or AB, antibodies of mother cross placenta leading to fetal hemolysis "less severe than Rh & may occur in 1st child".

+ Discuss causes of cholestasis (see hepatology chapter)

---

11. Define kernicterus and describe new born with this syndrome.

➔ *BIND:*

Clinical neurological complication of neonatal hyperbilirubinemia in the form of acute or

Chronic encephalopathy and permanent handicap.

➔ *Kernicterus:*

Yellow brain staining + evidence of brain damage due to UCB deposition in basal ganglia and cranial nerve nuclei.

➔ *Clinical picture:*

1. Acute bilirubin encephalopathy:

A. Early phase:

- Hypotonia & lethargy.
- Poor suckling.
- High pitched cry.

B. Intermediate phase:

- Hypertonia.
- Irritability.
- Seizures.
- Fever.
- High mortality.

C. Advanced stage:

- Opisthotonus.
- Sharp cry.
- Apnea.
- Seizures.
- Coma and death.

2. Chronic encephalopathy (kernicterus): Cerebral palsy with:

- Athetosis.
- Deafness.
- Limited upward gaze.
- MR.
- Dental dysplasia.

---

12. Discuss diagnosis of cases of neonatal hyperbilirubinemia.

In dealing with a case of hyperbilirubinemia you must take in consideration:

A. Timing:

- At < 24 hours → Rh-ABO incompatibility- Congenital infections.
- 2nd and 3rd day → Physiological jaundice – Polycythemia.
- 3rd – 7th day → Sepsis – Bruising – Crigler Najjar syndrome.
- > 2 weeks (prolonged jaundice) →

  a) Unconjugated: Breast milk jaundice – infection (particularly UTI) – Hypothyroidism – Gilbert disease – Najjar.

  b) Any cause of cholestasis.

B. History:

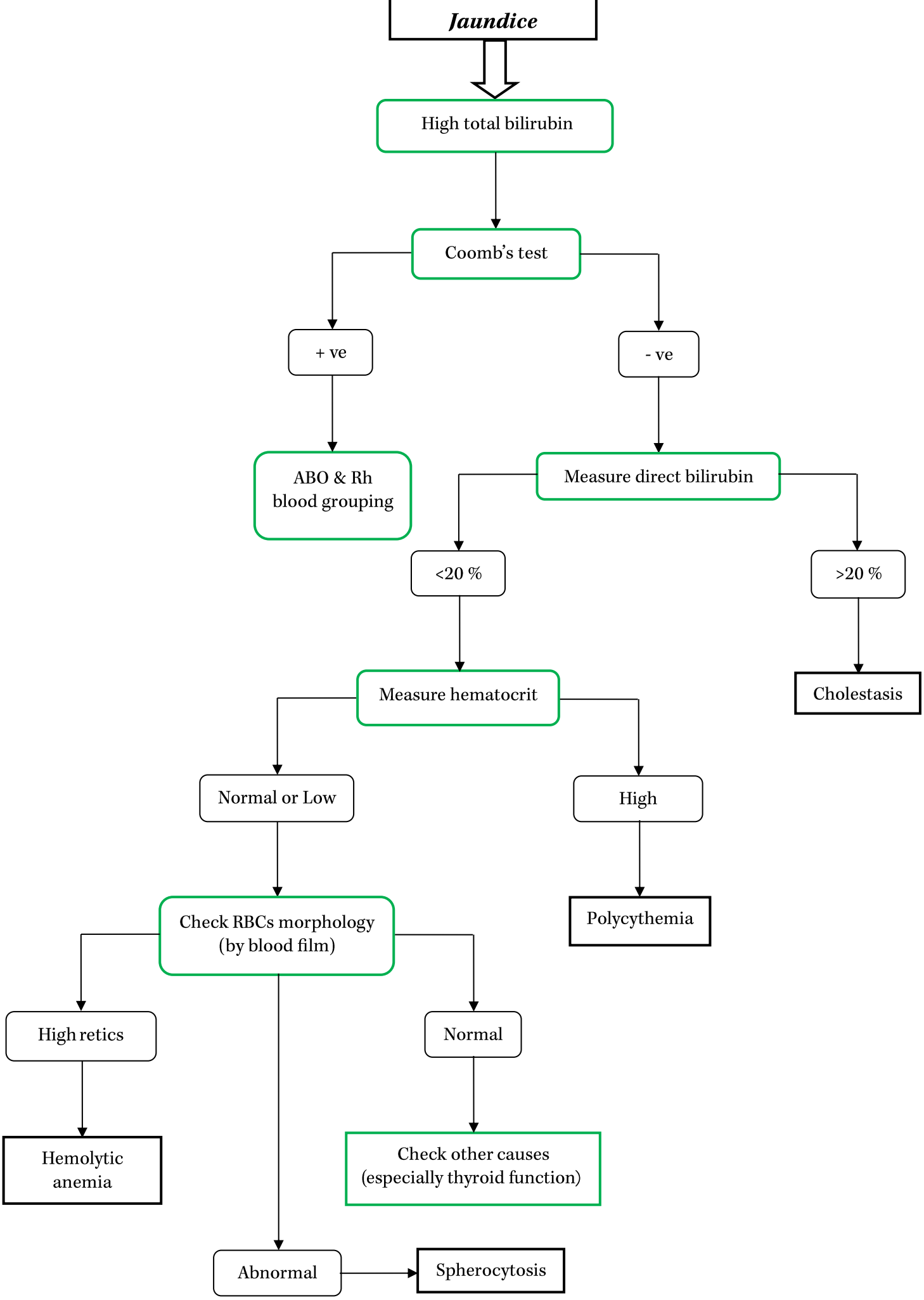
- Previous siblings (blood group incompatibility)
- Family history of any hemolytic anemia.
- Maternal illness During pregnancy (TORCH, DM)
- Maternal drugs: Sulphonamides, antimalarial (hemolytic anemia).
- Obstetric history: Forceps, ventouse deliveries may be related to cephalhematoma or intracranial hemorrhage,
- Breast feeding.

C. Examination

- Skin color: Yellow- orange (Unconjugated), greenish(Conjugated).
- Clinically: color density – spread from head to trunk to limbs (more severe)> Difficult to assess in dark skin > transcutaneous bilirubin check-blood sample.
- Prematurity, small for gestational age (polycythemia).
- Microcephaly (Inutero infection)
- Hepatosplenomegaly (Inutero infection, liver disease)
- Pallor (Hemolytic anemia, extravascular blood loss).
- Lethargy or poor feeding (neonatal sepsis).
- Omphalitis.
- Signs of hypothyroidism
- Signs of kernicterus (deep jaundice, convulsions, spasms).

D. Investigations:

1. Prove Unconjugated Hyperbilirubinemia:
   - Serum bilirubin: total bilirubin>7mg –if >15mg = pathological.
   - Direct bilirubin < 20% of the total.
2. Detect the cause:
   - CBC:
     decreased HB% & increased reticulocytes.
     If septicemia is suspected: WBC count – CRP – ESR – Cultures.
   - Exclude hemolytic disease of the newborn:
     Blood group & Rh for the baby and mother.
     Coombs' test.
   - Exclude hemolytic anemia:
     Osmotic fragility test: spherocytosis.
     Enzyme assay: G6PD deficiency.
   - Exclude Hypothyroidism: T4 &TSH
3. Investigations of cholestasis:
   - Increased bilirubin (direct >20% of total)
   - Increased AST, ALT, y-glutamyle transferase.


Jaundice
High total bilirubin
Coomb's test
+ ve
- ve
ABO & Rh blood grouping
Measure direct bilirubin
<20 %
>20 %
Cholestasis
Measure hematocrit
Normal or Low
High
Polycythemia
Check RBCs morphology (by blood film)
High retics
Normal
Hemolytic anemia
Check other causes (especially thyroid function)
Abnormal
Spherocytosis

13. Discuss phototherapy option for treatment of neonatal hyperbilirubinemia.

It is exposure to light of wave length 450-460 nm "blue, white, green".

➔ *Mechanism:*

Converts unconjugated bilirubin to nontoxic compound easily excreted in urine.

➔ *Technique:*

- Place infant at 45 cm distance.
- Expose maximum skin except genitalia & eyes.
- We can also use fiber optic blanket, or both can be used simultaneously.

➔ *Indications:*

1. Bilirubin > 15 mg % if full term.
2. Bilirubin < 15 mg % + risk factors:
    - Very low birth weight.
    - Hemolytic disease of newborn.
    - Bruised premature infant.
3. Before & after exchange transfusion.

➔ *Contraindication:*

In cholestasis (direct bilirubin becomes toxic isomer).

➔ *Side effects:*

- Diarrhea.
- Dermatitis: rash & erythema.
- Dehydration & hyperthermia.
- Defective maternal-child interaction.
- Corneal damage.

---

14. Enumerate 10 causes of neonatal respiratory distress.

List causes of cyanosis with respiratory distress in a newborn infant.

"Respiratory rate of normal newborn infant is 35-45 breaths per minute (shallower & rapid than adults due to small lung compliance)".

➔ *Causes of neonatal respiratory distress:*

I. Pulmonary causes:

1. Neonatal Respiratory Distress Syndrome (RDS): the commonest in **pre-term**, less common in full term.
2. Transient Tachypnea of Newborn (TTN): the commonest in **full-term**.
3. Meconium aspiration syndrome.
4. **P**neumonia: aspiration of meconium, secretions, milk, or intrauterine.
5. **P**ulmonary air leak: pneumothorax, pneumo-mediastinum, pneumo-pericardium, pulmonary interstitial emphysema.
6. Bronchopulmonary dysplasia: lung damage in premature infants from mechanical ventilation & oxygen toxicity.
7. **P**ulmonary hemorrhage (massive).
8. **C**ongenital lobar emphysema.
9. **C**ongenital diaphragmatic hernia.

II. Extra-pulmonary causes:

A. Airway causes (rare):

1. Choanal atresia (bilateral).
2. Pierre-Robin syndrome (small mandible & receding tongue).
3. Laryngomalacia.
4. Tracheo-esophageal fistula.

B. Chest wall causes (rare):

1. Thoracic dystrophy.
2. Myasthenia gravis.

C. Cardiac causes:

1. Congenital heart disease with heart failure.
2. Persistent fetal circulation.

D. Central causes (cerebral irritation):

1. Cerebral **H**ypoxia (encephalopathy).
2. Intracranial **H**emorrhage (birth trauma).
3. Drugs: narcotics.
4. Meningitis.

E. Metabolic causes:

1. **H**ypothermia.
2. **H**yperthermia.
3. **H**ypoglycemia.
4. Acidosis.

NB: Remember to write clinical picture of diseases discussed in detail in the chapter.

---

15. Discuss clinical features & management of neonatal respiratory distress syndrome.

Discuss causes & treatment options of RDS.

"Respiratory distress syndrome = Hyaline membrane disease".

➔ *Etiology:*

Diminished surfactant production by type II pneumocytes.

➔ *Surfactant:*

A. Chemistry:

- Major components of surfactant are phosphatidyl choline (lecithin), phosphatidyl glycerol (PG) & phosphatidyl inositol (PI).

B. Production:

- Produced by type II pneumocytes.
- From **22-24 weeks** of gestation at first by a pathway which is extremely sensitive to changes in temperature & pH.
- By the end of **35 weeks** of gestation, **mature surfactant** is produced by a second pathway that is more resistant to pH changes and hypoxia.

C. Function:

- Decreases alveolar surface tension; preventing alveolar collapse in expiration.

D. Factors affecting surfactant production:

Factors that increase the risk of RDS (- - surfactant)	*Factors that decrease the risk of RDS (++ surfactant)*
1. Prematurity (most important, more in males). 2. Infants of diabetic mothers. 3. Infants who are the second of twins. 4. Infants born by caesarean section. 5. Erythroblastosis fetalis.	1. Premature rupture of membranes (> 48 hours). 2. Pre-eclampsia & other hypertensive states. 3. Prenatal steroids or thyroid hormone therapy for 48 hours prior to delivery.

➔ *Pathophysiology (effect of surfactant deficiency):*

- Increased surface tension of alveoli (decreased lung compliance).
- Alveolar collapse.
- Peripheral tissue hypoxia (due to ventilation/perfusion mismatch) leading to metabolic acidosis.
- Respiratory acidosis (+ CO_2) occurs due to alveolar hypoventilation.
- Acidosis & hypoxia lead to reduced myocardial contractility (low cardiac output & hypotension).
- High pressure is needed to expand the lungs (severe RDS).
- Pulmonary hypertension (vasoconstriction) with right to left shunting will occur.

➔ *Pathology:*

Gross: liver-like lung consistency.

Microscopic: collapsed alveoli with hyaline membrane inside (proteinaceous material inside alveoli).

➔ *Clinical picture:*

Severe progressive respiratory distress **at delivery or few hours after birth.**

Inspection & palpation:

- Grade I: tachypnea (above 60/minute) & working alae nasi.
- Grade II: intercostal & subcostal retraction.
- Grade III: expiratory grunting.
- Grade IV: cyanosis or altered consciousness in advanced cases.

Auscultation:

Diminished air entry.

➔ *Complications:*

A. Barotrauma:
   1. Interstitial emphysema.
   2. Pneumo-mediastinum.
   3. Pneumothorax.

B. Hemorrhage:
   1. Pulmonary hemorrhage.
   2. Intracranial hemorrhage.

C. Chronic complications:
   1. Lobar emphysema.
   2. Bronchopulmonary dysplasia.
   3. Subglottic stenosis.

➔ *Investigations:*

A. Chest x-ray:

- Diffuse reticulo-granular pattern of **both lungs**.
- Air bronchogram (air in major bronchi appears in contrast with the white background of collapsed alveoli).
- Complete opacification of both lung fields (white lung) in severe conditions.

B. Blood gases:

- Hypoxia.
- Hypercapnia.
- Acidosis.

NB:

3 things cause ventilation perfusion mismatch:

- Hypoxia
- Hypercapnia
- Acidosis

➔ *Prevention:*

1. Good ante-natal care reduces incidence of prematurity.
2. Antenatal corticosteroids: Betamethasone or dexamethasone at 24-34 gestational weeks (48 hours before delivery).

➔ *Treatment:*

Aim:

Life support till adequate amount of surfactant is formed about 36-48 hours after birth.

A. Basic life-support measures:

1. Temperature control & incubator care to avoid hypothermia.
2. Correction of acidosis, fluid & electrolyte imbalance.
3. Prophylactic antibiotics till cultures appear (as RDS is clinically indistinguishable from early-onset severe group B streptococcal disease "controversial").
4. Proper inotropic support if needed.
5. Strict asepsis while handling the baby.

B. Monitoring:

1. Clinical:
   - Vital signs (heart rate, respiratory rate, temperature & blood pressure).
   - Oxygen saturation by oximeter.
2. Lab monitoring:
   - Arterial blood gases (PaO_2, $PaCO_2$, pH & base deficit).
   - Hemoglobin.
   - Electrolytes, calcium, glucose & albumin.
   - C-reactive protein & ESR.

C. Correction of hypoxia:

1. Nasal continuous positive airway pressure (CPAP):

If PO_2 less than 60 mmHg.

2. Intermittent positive pressure ventilation (IPPV):
   If:
   - PO_2 less than 50 mmHg in 100% oxygen.
   - PCO_2 more than 70 mmHg.
   - PH < 7.2.
3. High frequency ventilation:

In cases with risk of air leak (respiratory rate between 300-600/minute).

D. Surfactant replacement therapy:

- Natural or synthetic surfactant.
- Given to severe cases via endotracheal tube.
- Decreased mortality of preterm infants with RDS (40%).

---

16. Transient tachypnea of newborn.

➔ *Definition:*

Transient respiratory distress due to diminished clearance of lung fluids after birth.

➔ *Incidence:*

The most common cause of respiratory distress in **full-term**.

➔ *Clinical picture:*

- Mild respiratory distress: tachypnea & minimal retractions.
- Cyanosis in severe cases.
- Self-limited: improvement usually occurs after 24-72 hours.
- Diagnosis is made after exclusion of other causes of respiratory distress.

➔ *Investigations:*

X-ray:

- Increased pulmonary vascular markings: prominent para-hilar streaks (engorgement of lymphatic system with retained lung fluid).
- Fluid in inter-lobar fissures.
- Small pleural effusions maybe seen.

➔ *Treatment:*

1. Supportive care:
   - IV fluids, gavage feedings.
   - Regulation of body temperature.
2. Supplemental oxygen:
   To maintain adequate arterial oxygen saturation.
3. ABG assessment:
   Repeated, if the condition worsens.
4. Chest radiography:
   Repeated, if clinical deterioration is observed.

(Enumerate life support measures & monitoring discussed before).

---

17. Neonatal pneumonia.

➔ *Types & pathogenesis:*

1. True congenital pneumonia (in-utero).

2. Intra-partum pneumonia (during passage through birth canal).
3. Post-natal pneumonia (immediately after birth).

➔ *Etiology:*

Causative organisms:

- Gram –ve bacilli: E. coli, klebsiella, pseudomonas, hemophilus.
- Gram +ve bacteria: staph. aureus, group B streptococci, listeria.
- Non-bacteria: cytomegalovirus, toxoplasmosis.

Intrauterine (transplacental)	*Prenatal*	*Postnatal*
CMV	Group B streptococci	Coagulase –ve staphylococci
HSV	Listeria	Staphylococcus aureus
Rubella	Enteric bacteria	Candida

Route of transmission:

- Ascending transmission (from aspiration of infected or contaminated maternal fluids).
- Hematogenous.

Risk factors:

- Prolonged rupture of membranes.
- Chorio-amnionitis.
- Meconium aspiration.
- Prematurity.
- Fetal asphyxia.
- Indiscriminate use of broad-spectrum antibiotics in NICUs "neonatal intensive care units".

➔ *Clinical picture:*

Respiratory distress in the 1st few hours/days after birth.

➔ *Investigation:*

Chest x-ray: patchy opacities of variable shape & distribution.

➔ *Treatment:*

Broad spectrum antibiotics until culture & sensitivity results appear.

---

18. Meconium aspiration syndrome.

➔ *Definition:*

Meconium is the early feces passed by a newborn soon after birth, before the baby has started to digest breast milk or formula.

➔ *Etiology of meconium aspiration:*

- In some cases, the baby passes meconium while still inside the uterus.
- This usually happens when babies are under stress (acute or chronic hypoxia).
- Meconium passes into surrounding amniotic fluid.
- The baby may breathe meconium into the lungs.
- This may happen while the baby is still in the uterus, or still covered by amniotic fluid after birth.

➔ *Risk factors that may cause intrauterine fetal stress:*

- Aging of placenta (if pregnancy goes far past the due date = post-term).

- Decreased oxygen to the infant while in uterus (fetal hypoxia).
- Acute hypoxia: complicated delivery or prolonged labor.
- Chronic hypoxia: High blood pressure or diabetes in pregnant mother (placental insufficiency).

➔ *Clinical features:*

- Manifestations of respiratory distress: tachypnea, chest retractions & grunting are evident at birth.
- Chest is hyperinflated.
- Auscultation reveals abnormal breath sounds (esp. coarse crepitations).
- Skin, nails & umbilical cord usually meconium-stained.
- The baby maybe severely cyanosed (respiratory failure).

➔ *Investigations:*

1. Chest x-ray:

Patchy or streaky areas of lung collapse + Areas of over-inflation (due to ball and valve effect of meconium; allowing air in but not out).

2. ABG:

- Hypoxia.
- Hypercapnea.
- Acidosis.

➔ *Complications:*

1. Obstruction of air passages by meconium: collapse or emphysema.
2. Pneumonia (chemical pneumonitis & secondary bacterial infection).
3. Pneumothorax, pneumo-mediastinum.
4. Pulmonary hypertension.
5. Hypoxic ischemic encephalopathy.

➔ *Management:*

A team that is highly skilled at reviving newborn infants should be at the delivery room.

1. Prevention of aspiration by proper suction of the nose and trachea by endotracheal tube after delivery of the head.
2. Tracheal intubation & meconium suction from lower airway in any infant who has respiratory depression and presents during delivery with meconium stained amniotic fluid, or any infant with thick meconium.
3. Supportive measures: oxygen, mechanical ventilation, correction of acid-base imbalance, maintain body temperature & antibiotics (monitoring & correction of hypoxia: discuss as before).

Mnemonic for management of RDS, transient tachypnea of newborn, meconium aspiration:

نحفظها بالأغنية دي : راقبه و عيشه و بoxygen نعنشه :D
راقبه: Monitoring (clinical, lab)
عيشه: و دي ليها أغنية بردو :3 (دفيه و ظبط اللي فيه و بantibiotics اعميه)
دفيه: thermoregulation
ظبط اللي فيه: correct any fluid or electrolyte imbalance
Prophylactic antibiotics
نعنشه: ABC و معاها oxygen support

19. Define neonatal apnea. Mention its causes and management. (September 2014)

➔ *Definition:*

It is cessation of respiration for more than 20 seconds or accompanied by bradycardia < 100 beats or accompanied by cyanosis.

➔ *Causes:*

A. Prematurity.

B. Secondary to:

1. Metabolic: hypoglycemia - hypocalcemia.
2. Temperature instability: hypothermia or hyperthermia.
3. Maternal drug intake: e.g. magnesium sulfate or intra-partum sedatives.
4. Neonatal sepsis.
5. Intracranial hemorrhage.
6. Brain hypoxia: e.g. RDS.
7. Neonatal seizures.
8. Gastro-esophageal reflux – aspiration.
9. With interventions: e.g. suction or endotracheal tube insertion.

➔ *Management:*

Investigations:

1. Sepsis screening: CBC, CRP, blood culture.
2. Serum calcium and electrolytes – blood sugar.
3. Cranial ultrasound – brain CT: when intracranial causes are suspected.

Treatment:

A. Monitoring:

By bedside respiratory and heart rate monitor:

- With alarm if respiration ceases for more than 20 seconds.
- Or if heart rate drops below 100 bpm → confirms serious apnea.

B. Acute apneic spell:

- Tactile stimulation needs to be given.
- If does not respond → bag and mask ventilation + suctioning + positioning.

C. Chronic/recurrent apneic episodes:

Management depends on: frequency, duration of episodes & level of hypoxia.

1. Treatment of the cause.

2. Pharmacologic therapy:

a. <u>Caffeine citrate:</u>
   - Loading: 20 mg/kg/dose IV drip over 30 min.
   - Maintenance: 5 mg/kg/day – once a day.

b. <u>Theophylline:</u>
   - Loading: 6 mg/kg/dose IV drip over 30 min.
   - Maintenance: 6 mg/kg/day divided Q6H/Q8H.

3. Continuous positive airway pressure (CPAP):

- It is effective in treating obstructive and mixed apnea but not central.
- Delivered by nasal prongs or by an endotracheal tube placed in the nasopharynx.

- Start with a CPAP level of 5 cm H_2O. Further adjustment should be based on clinical response.

4. *Intermittent mandatory ventilation (IMV):*
   - If significant apnea persist despite using medical treatment and CPAP.
   - Settings need to be clinically adjusted to prevent desaturation or cyanosis.
   - To minimize barotrauma: short inspiratory times and minimal peak inspiratory and expiratory pressures should be used.

---

20. Mention neonatal problems associated with maternal diabetes mellitus. (2016)

1. Risk for spontaneous abortion, still birth, congenital malformations.
2. Macrosomia: More than 60% LGA.
3. IUGR:

   Intrauterine growth retardation due to advanced diabetic vascular disease which leads to poor blood supply to the fetus.
4. Birth injuries:

   Due to macrosomia and cephalo-pelvic disproportion:
   - Cephal-hematoma.
   - Shoulder dystocia.
   - Brachial plexus injuries (Erb's palsy).
   - Phrenic nerve paralysis (C3-5).
5. Hypoglycemia:
   - Sudden interruption of glucose.
   - High neonatal insulin level.
6. Hypocalcemia and hypomagnesemia.
7. Polycythemia.
8. Indirect hyperbilirubinemia: Due to polycythemia and relative immaturity of hepatic bilirubin conjugation and excretion.
9. Respiratory problems: RDS – TTN.
10. Cardiac functional abnormalities:
    - 30% VSD.
    - Hypertrophic cardiomyopathy.
11. CNS:

    Seizures, jitteriness, lethargy, change in tone due to asphyxia, hypoglycemia, polycythemia.
12. Long-term sequelae: Cognitive dysfunction.

---

21. Discuss management of IDMs. (June 2011)

1. Hospital delivery for monitoring.
2. Monitoring of blood glucose within 30 minutes then every 3 hours for 48 hours.
   - Normoglycemic: start early feeding.
   - Breast feeding should be started as soon as the infant is stable.
3. Monitoring of respiratory, cardiac, GIT, CNS, skeletal and motor.
4. Sometimes unstable babies require admission to the NICU.

OTHER TOPICS:

1. **Define hypothermia in neonates. Mention its causes, clinical picture and treatment.**
   - ➔ *Definition:*

     Lowering of body temperature below 35.5°C.
   - ➔ *Causes:*
     1. Cold environment.
     2. Inadequate drying after birth.
     3. Inadequate clothing.
     4. Sepsis.
     5. Prematurity due to:
        - Immaturity of heat regulatory center.
        - Small muscle bulk.
        - Large surface area of skin.
        - Diminished fat insulation.
        - Diminished intake.
        - Associated illness.
   - ➔ *Clinical picture:*
     1. Peripheral vasoconstriction:
        - Acrocyanosis – blue extremities.
        - Cool extremities.
        - Decreased peripheral perfusion.
     2. CNS depression:
        - Lethargy.
        - Bradycardia.
        - Apnea.
        - Poor feeding.
     3. Increased metabolism:
        - Hypoglycemia.
        - Hypoxia.
        - Metabolic acidosis.
     4. Increase of pulmonary artery pressure:
        - Distress.
        - Tachypnea.
   - ➔ *Treatment:*
     1. Gradual warming.
     2. Symptomatic treatment.

N.B.

Mnemonic for causes of hyperthermia "***DIE":***

- **D**ehydration
- **I**nfection
- **E**nvironment

Mnemonic for causes of hyperthermia ***"TIE":***

- Pre**T**erm
- **I**nfection
- **E**nvironment (clothing, inadequate drying, cold environment)

---

2. List causes of neonatal anemia.

"As in hematology chapter".

RBC (↓production - ↑hemolysis)
Blood (↓volume فجأة - ↑bleeding)

I. Physiologic anemia:

➔ *Causes:*

Blood (4): ↑hemolysis (3) – 1,2 ↓production of RBCs.

1. Increased oxygen saturation → ↓ erythropoietin → ↓ RBCs production.
2. Deficiency of folic acid & vitamin E.
3. Short life span of RBCs.
4. Rapid expansion of blood volume (1st 3 months).

II. Pathological anemia:

(1) Blood (2) hemolysis (3) ↓RBCs production.

1. *Blood loss (الأشهر in neonates):*
   A. Occult blood loss:
      - Feto-maternal bleeding.
      - Placental malformation (chorioangioma).
      - Twin-to-twin (feto-fetal) transfusion.

Occult = (لا يرى في الولادة) مخفي.

Feto-fetal: → polycythemia والتاني أنيميا لأحدهما فيحصل ؛ دم التاني من بياخد واحد .

   B. Obstetric causes:
      - Placental anemia.
      - Placental incision at CS.
      - Rupture of cord.
   C. Bleeding in neonatal period:
      - Hemorrhagic disease (↓ of vitamin K).
      - Intracranial hemorrhage.
      - Cephal-hematoma & bleeding from umbilicus.
      - Frequent blood sampling for investigations.

دم neonate قليل جدًا؛ حتى العينات الصغيرة لو متكررة تؤثر فيه.

2. *Hemolysis:*
   A. Hemolytic diseases: ABO-Rh incompatibility.
   B. Hemolytic anemia: G6PD deficiency, pyruvate kinase deficiency. Hereditary spherocytosis.
3. *Decreased RBCs production:*
   A. Congenital hypoplastic anemia.
   B. Acquired infection (rubella-parvo virus).
   C. Infiltration: congenital leukemia.
   D. Osteopetrosis.

Parvovirus متخصص في الbone marrow.
Osteopetrosis: العظم الرخامي: مفيش cavity لكن ضعيف والbone marrow depressed في (hepatosplenomegaly)

---

3. Define neonatal polycythemia, mention its causes, cl/p, and management

➔ *Define:*

Hematocrit value > 65% & Hb % > 21 gm/dl

➔ *Causes:*

A. Placental red cell transfusion

1. Cord stripping
2. Holding baby below the mother at delivery → placental squeezing بيعمل
3. Maternal fetal transfusion
4. Twin to twin transfusion

دم من أحدهم يروح للثاني، واحد يجيله anemia والثاني polycythemia

B. Placental insufficiency SGA newborn

1. Post term newborn

Placenta ← لما تبقا عجوزه ماتنقلش دم كويس ← ischemia ← hypoxia

و الhypoxia ← erythropoietin increases- والSGA ← أكيد hypoxia

2. Infant of toxemic mother ----- insulin ← diabetic الوالأم ال

C. Other causes: LGA newborn

(hyperinsulinism stimulate bone marrow)

→ *Clinical picture*

- Asymptomatic in 15: 25 %
- Symptomatic:

3 colors → yellow (jaundice), blue (cyanosis), red (plethoric)

3 big systems (CNS, CVS, Resp.)

3 metabolic (hyperblirubinemia, hypoglycemia, hypocalcemia)

1. Plethoric & cyanotic

Cyanosis ← تظهر لما non- oxyg Hb (يزيد عن 5gm) وهنا الHb كله زاد

2. Metabolic:
   - Hyperbilirubinemia (بيزيد التكسير)
   - Hypoglycemia (increases RBCs requirements)
3. CNS:
   - Lethargy
   - Hypotonia (ischemia → suppression)
   - jitteriness
   - Convulsions (cell death …)
4. CVS:
   - Congestive heart failure
   - Renal vein thrombosis
   - Respiratory distress & apnea

Respiratory/CNS/CVS ← بسبب thrombi (infarctions)

➔ *TTT:*

- Symptomatic/hematocrit > 70% / Hb > 21:

  Partial exchange transfusion (fresh plasma or normal saline)

  - الneonate ← دمه قليل، ماينفعش تشيل منه فقط
- Asymptomatic/ hematocrit 65-70%: Push I.V. fluids

In management of hypoglycemia, hypocalcemia, polycythemia, hypomagnesemia:

شوف ال symptoms موجودة ولا لا وقيس levels و اجري هات محلول ١٠% فيهم كلهم ما عدا ال polycythemia: هات saline 0.9%

---

4. Describe DD & management of neonatal bleeding

➔ *DD*

	C/P	*Investigations*
1. Hemorrhagic diseases	Bleeding: GIT-urinary-umbilicus- circumcision	Inc PT, PTT, clotting time dec factor 2, 7, 9, 10
2. DIC		Fibrinogen & fibrinogen degradation
3. Hemophilia A	• Extensive bruising • Hematoma • Hemoarthrosis	• Inc PTT • Dec factor VIII
4. Hemophilia B	Hemophilia A 'delayed onset'	
5. Immune thrombocytopenia		

6. Maternal lupus

7. Drugs

8. Necrotizing enterocolitis

9. Fanconi anemia

10. Vascular

11. Obstetric

Classify into healthy & sick newborn:

Bleeding in a healthy newborn:

- Hemorrhagic disease in the newborn (most common).
- Neonatal thrombocytopenia e.g. maternal lupus, maternal ITP, maternal drugs.
- Hemophilia.

Bleeding in a sick newborn:

- DIC.
- Neonatal septicemia.
- Neonatal liver disease.

---

5. Describe diagnosis and treatment of neonatal sepsis?

➔ *Diagnosis:*

A. Clinical picture

baby not doing well

1. Temperature (hypothermia or hyperthermia)

2. Abdominal distention
3. Feeding problems: poor feeding – vomiting
4. Respiratory distress or apnea
5. Tachycardia or bradycardia
6. Hyperglycemia or hyper glycemia
7. Irritability, fatigue, lethargy
8. Complication:
    a) bulging anterior fontanel suggesting meningitis
    b) DIC-septic shock –Renal Failure

B. Investigation

WBCs& CRP +ESR +culture

1. Leucopenia (TLC < 5000/mm3) or leukocytosis TLC > 15000/mm3
2. Neutropenia (ANC <1800/mm3)
3. immature to total neutrophils (I/T) ratio > 20%
4. CRP: positive
5. ESR: high
6. culture of CSF, Tips of removed ETTs, umbilical Catheter or central lines

➔ *Treatment:*

Protocol

- 1st line → penicillin + aminoglycoside e.g., ampicillin +gentamicin
- 2nd line →third generation cephalosporin +aminoglycoside

Route: IV antibiotics (we avoid oral or IM due to poor absorption by these routes)

Duration:

- Probable sepsis: 5-7 days
- Clinical definition but not culture: 10 -14 (2 weeks)
- culture +ve sepsis: 14 days (2 weeks)
- meningitis: 3 weeks
- septic arthritis 4-6 weeks

When to start:

1. suspected sepsis: (risk factors only) in asymptomatic full term > observation & sepsis screening
2. If symptomatic full term: Sepsis screening and blood culture then start Abs.
3. suspected sepsis in asymptomatic pre-term: Sepsis screening and blood culture, Start Abs

---

6. Enumerate clinical features of sepsis? (June 2012)

لازم هتقول للدكتور : الولد همدان وأصفر عنده سخنيه ومش بيرضع وبيرجع وبطنه منفوخة .. الباقي كل حاجة والعكس

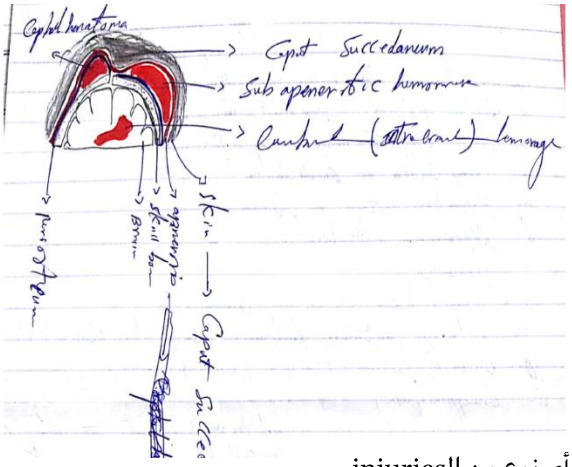
1. The baby not doing well (poor suckling reflex)
2. Feeding problems (poor breast feeding - vomiting)
3. Fever (hyperthermia or hypothermia)
4. Respiratory distress or apnea
5. Tachycardia or bradycardia
6. Abdominal distention
7. Jaundice

8. Irritability, seizures, convulsions
9. Bulging anterior fontanel (suggesting meningitis)
10. Liver cell failure – MOSF- renal failure
11. Encephalopathy

---

7. Discuss in detail the 4 types of common injuries of newborn (2015)

1. Skin - caput succedaneum
2. Sub aponeurotic hematoma
3. Cephalohematoma
4. Intra cranial hemorrhage



مش شرط cranial injuries بس .. اكتب أي نوع من الinjuries ..

Discuss in detail the 4 types of common injuries of newborn (2015)

	1. Caput Succedaneum	***2.Cephal Hematoma***
Pathology	Edema of Sub-cutaneous tissue.	Between periosteum and skull bone.
Swelling	Present at birth Over the presenting part Crosses suture lines Pitting in nature Disappear in 1-2 days	Present 1-2 Days Over the parietal bone Doesn't crosses suture lines Cystic in nature Disappear in 2 weeks
Complication	NO complication	Anemia and Jaundice
Treatment	Nothing	Avoid aspiration +/- Blood transfusion & PHOTO

3. SUB GALEAL Hemorrhage

→ *Definition*

it's hematoma under the aponeurosis of the scalp but outside the periosteum

→ *Cause:*

it's usually been after ventose or forceps delivery

→ *Site:*

spread over head and down to the eye

→ *Complication*

1. hypovolemia (that needs transfusion)
2. hyper bilirubinemia

4. Intra cranial hemorrhage

→ *Definition:*

hemorrhage inside cranium

→ *Incidence:*

40% of preterm babies below 34 weeks

→ *Types and complication:*

- Full term/ due to trauma
- In very low birth weight: intraventricular and intracerebral (anoxia or coagulation & vascular defect).

→ *Predisposing factors:*

1. trauma (use of ventouse -anoxia -seizures)
2. congenital vascular anomalies – bleeding tendency

→ *Clinical picture:*

- The majority occurs during the first 48 hours to the first week
- Asymptomatic in 50% of cases
- Bleeding leads to anemia &jaundice and if severe > shock
- Tense bulging anterior fontanel
- Poor feeding
- Coma
- Convulsions
- Focal neurological damage
- Meningeal irritation
- Increased cranial tension (vomiting – bulging anterior fontanel)

→ *Complication:*

1. blindness
2. Deafness
3. Hydrocephalus
4. Cerebral palsy
5. Epilepsy

→ *Investigation:*

- Radiological → ultrasound & CT
- LAB →Coagulation profile, CBC, PT, PTT, Bilirubin)

→ *Prevention:*

VIT K: Maternal 20 Mg Once 2 days before delivery

→ *Treatment:*

1. Incubation and Care
2. VIT K – Blood- Plasma
3. TTT OF complication
4. ANTI convulsion drugs Diazepam or Phenobarbitone)

	Erb's paralysis	***Klumpke's paralysis***
Causes	Occurs in breech presentation or shoulder dystocia form traction on the brachial plexus	Occurs in breech presentation or shoulder dystocia form traction on

	nerve roots	the brachial plexus nerve roots
Root injury	C5&C6	C8&C11
Muscle affected	Arm & Forearm	Muscles of the hand
Limb Position	Arm: Adduction Fore arm: pronation **policeman tip**	Hand; mid-way between flexion and extension
Reflexes	Absent moro reflex intact grasp	intact moro Absent grasp reflex
Investigation	Nerve conduction velocity (NCV)	

---

8. How to ensure successful breastfeeding in healthy newborn?

1. *Skin to skin contact strategy.*
   - After drying the baby s and ensuring adequate airway and breathing
   - The baby is put naked on the mother s chest between her breasts
   - Warming the baby, reduce neonatal stress and promote breastfeeding
2. *Early breastfeeding:*
   - Within the first hour after birth. The colostrum is adequate for the baby.
   - Improves breastfeeding outcome
3. *Avoid giving the baby glucose:*
   - Only in hypoglycemia
   - Nutritionally deficient and babies refuse breast milk
4. *Rooming in:*
   - The baby should stay in the mother's room; or better co-bedding.
   - This decreases the neonatal stress and allows for more frequent breastfeeding (stimulate production of lactation hormones)
5. *On demand feeding, with no restrictions to time, frequency or duration*
   - The more the baby withdraws milk, the more the prolactin and milk are produced. Even twins can depend on breast milk exclusively.
   - This signals the breast (extra demand produces extra supply)
6. *Exclusive breastfeeding without supplements*
   - It is recommended in the first six months
   - Any supplements give to the baby will decrease the demand on the breast and the supply will decrease
7. *Ensure perfect positioning of the baby and latching on the breast*
8. *The baby should empty the breast before switching to the other:*
   - Milk at the end of the feed contains good fat essential for brain growth.
9. *Avoid the use of pacifiers.*
   - Can slow down the weight gain
     >It satisfies the baby s hunger (reduce the demand on the breast).
     >It trains the baby to latch poorly (reduce the demand)
     > Oral fungal infections and pain that reduce feeding.
10. *Avoid bottle –feeding as it leads to nipple confusion.*

IMPORTANT NOTES:

1- Vernix caseosa → White greasy substance covering skin.
2- Mongolian spots → bluish discoloration of skin.
3- Lanugo hair → fine facial and body hair.
4- Milia → obstructed sebaceous glands.
5- Salmon patch → Distended dermal capillaries (Nevus simplex).
6- Port wine stain → flat mildly elevated skin lesion (Nevus flammeus).
7- Air in the bowel wall → x-ray sign of Necrotizing Enterocolitis.
8- Bronzed baby syndrome →Discoloration of skin due to cholestasis treated by phototherapy.
9- Most Common cause of bleeding in newborn → Hemorrhagic disease of newborn.
10- Most Common organism causing neonatal sepsis → G-ve as Klebsiella, pseudomonas, E-coli.
11- Most common bone injury → fracture clavicle.
12- Erb's palsy → nerve C5, C6 injury.
13- Klumpke's paralysis → nerve C8, T1 injury.
14- sternomastoid tumor → hernatoma due to swelling in lower half of muscle.
15- Double bubble sign → x-ray of duodenal atresia.

Other notes:

- **Respiration** is entirely diaphragmatic (abdomino-thorathic)
  rate →30-40, tachypnea > 60 (الضعف)
- **HR** →90 during sleeping, 180 during activity (الضعف)
- **BP** →70/50 at birth, 80/60 by 4th day +10
- **Apex** →3rd or 4th left intercostals, outside MCL فوق عند الكبار
- **Liver** → Palpable at RMCL ,2-4 cm below the costal margin فوق عند الكبارnormally there is divarication of Recti
- **Umbilical cord** → completely sloughed between 6th -10th day.
  - Timing of neonatal screening: after initiation of milk feeding between 3rd and 5th day.
  - Neonatal screening → Screening for biochemical anomalies as:
    hypothyroidism, PKU, galactosemia, G6PD deficiency, and others as cystic fibrosis.

Cardiology

SHORT ESSAY QUESTIONS: (EXAM QUESTIONS)

1. Discuss large ventricular septal defect.

➔ *Incidence:*

VSD is the commonest (30% of all congenital heart diseases).

➔ *Defect:*

1. Single membranous (perimembranous): adjacent to the tricuspid valve (80%).
2. Single or multiple muscular "Swiss cheese VSD" (20%).

➔ *Hemo-dynamics:*

- Blood shunted from left ventricle to right ventricle during systole.
- The amount of shunt depends on the size of the defect.
- No shunt occurs during diastole as pressure in both ventricles equals zero.
- Blood passes to right ventricle causing dilatation.
- Blood passes to the lung resulting in pulmonary congestion.
- Blood passes to the left ventricle (dilatation due to volume overload).

➔ *Clinical picture:*

1. *Small VSD (< 3mm) = Roger's disease:*

   Symptoms: Asymptomatic.

   Signs: Pan systolic murmur over the left sternal border – normal heart sounds.

2. *Large VSD:*

   Symptoms:

   - Appear on the second week.
   - Difficult feeding – excessive sweating – failure of growth – recurrent chest infection.

   Signs:

   General examination:

   Chest infection, failure to thrive and signs of heart failure (3T)

   Local examination:

   a. Inspection and palpation:
      - Biventricular enlargement (mainly left ventricle) with active precordium.
      - Systolic thrill over the left parasternal area.

   b. Auscultation:

      Sounds:

      Accentuated 2nd heart sound on the pulmonary area (pulmonary component of S2).

      Murmur:

   - Site: Left parasternal area.
   - Character: Harsh.
   - Timing: Pan-systolic (= holo-systolic).
   - Area of propagation: radiating to the precordium.

   "Harsh pan systolic murmur on the left parasternal area radiating to the whole

precordium".

ممكن نكتب تفاصيل أكتر عن الexamination من العملي

➔ *Complications:*

1. Pulmonary hypertension & Eisenmenger syndrome:
   - High pulmonary flow (in large VSD) leads to pulmonary vasoconstriction at early stages with later irreversible vaso-obstruction and pulmonary hypertension (pressure overload in pulmonary artery & right ventricle).
   - If the pressure exceeds that in the left side, the direction of blood flow through the VSD is reversed from (left to right) to (right to left).
   - This means deoxygenated blood escapes to the systemic circulation through aorta leading cyanosis (in 6 months to 6 years in severe cases).
2. Repeated chest infection.
3. Congestive heart failure.
4. Infective endocarditis.
5. Stunted growth.

➔ *Investigations:*

1. Chest X Ray: ***the initial investigation***

- Cardiomegaly (biventricular enlargement, mainly left ventricle)
- Pulmonary plethora (increased pulmonary vascular markings)
- Prominent pulmonary artery

2. ECG:

- Biventricular hypertrophy – mainly the left ventricle.

3. Echo: ***the diagnostic investigation***

- It shows position & size of the defect & blood flow across.
- It assesses the pulmonary pressure.
- It assesses cardiac dilation and efficacy of contractility.

4. Investigations of complications:

- Sputum culture if chest infection
- Blood culture if endocarditis

➔ *Treatment:*

A. Medical treatment:

- Small asymptomatic: spontaneous closure (protection against infective endocarditis by good dental hygiene & prophylactic antibiotics before dental extraction or any operation with bleeding).
- Treatment of complications: heart failure (diuretics as Furosemide & vasodilators as Captopril) and chest infection (discuss).

NB:
HF treatment → emergency chapter.
Infective endocarditis prophylaxis → see later & discuss.

B. Surgical treatment:

For symptomatic cases: surgery or trans-catheter closure at 3-6 months to prevent growth failure and pulmonary hypertension.

➔ *Prognosis:*

- 30%: close spontaneously.

- Large VSD: heart failure in 6 weeks or Eisenmenger syndrome as early as 6 months.

---

2. Mention the diagnostic features and management of patent ductus arteriosus in children.

➔ *Definition:*

It is a pathological condition in which ductus arteriosus (between descending thoracic aorta & pulmonary artery) fail to close by one month after birth due to a defect in constrictor mechanism of the duct.

➔ *Incidence:*

- It is more common in females, congenital rubella syndrome & preterm.
- 5-10% of all congenital heart diseases.

Ductus arteriosus:

- The duct between the descending thoracic aorta and pulmonary artery.

- It is present intrauterine to bypass the non functioning lung and drive the blood from the right ventricle to the left ventricle.

- Closes spontaneously after birth in response to oxygenated blood.

➔ *Hemodynamics:*

- In fetal life, ductus arteriosus diverts blood from pulmonary artery to aorta.
- After birth, pressure is higher in aorta than pulmonary artery in systole & diastole.
- Blood is continuously shunted from aorta to pulmonary artery.
- Lung is congested & blood goes back to left ventricle (volume overload).

Diagnostic features:

➔ *Clinical picture:*

A. Small duct defect:

- Asymptomatic.
- A murmur may be discovered accidently (normal heart sounds).

B. Large duct defect:

➢ *Symptoms:*

- Appear on the second week.
- Difficult feeding – excessive sweating – failure of growth – recurrent chest infection.

➢ *Signs:*

1. *General examination*:
   - Water hammer pulse; due to big pulse volume.
   - Blood pressure: systolic blood pressure is high & diastolic blood pressure is low.
2. *Cardiac examination:*

Inspection & palpation:

- Left ventricular enlargement.
- No thrill.

Auscultation:

1. Heart sounds:
   The pulmonary component of second heart sound (P2) becomes louder.
2. Murmurs:
   Appear after the first week, below the left clavicle as loud continuous machinery murmur.

➔ *Investigations*:

A. Chest x-ray:

Cardiomegaly, prominent pulmonary artery, congested lung.

B. ECG:

Left ventricular enlargement.

C. *Echo:* it is diagnostic as it shows;

- Position and size of the defect, and blood flow across.
- Assess the pulmonary pressure.
- Assess the cardiac dilation and efficacy of contractility.

➔ *Complications:*

As VSD (discuss) but cyanosis of Eisenmenger usually involves the **lower half of the body** (called differential cyanosis).

➔ *Treatment:*

A. Medical:

1. In preterm: Anti-prostaglandin **"Indomethacin",** very effective in first week (closes the duct). "ineffective in full-term"
2. **Treatment of complications:** HF (diuretics as Furosemide and afterload reducing agents like Captopril) and chest infection.
3. Protection against **infective endocarditis** by good dental hygiene and antibiotics prophylaxis before dental extraction or any operation with bleeding.

B. Surgical:

Surgical closure of the duct **or** by a coil or occlusive device **"catheter closure"** before the age of one year.

---

3. Discuss coarctation of the aorta.

➔ *Defect:*

Narrowing at the beginning of the descending aorta (just distal to the duct and the origin of the left subclavian artery).

➔ *Incidence:*

Common in Turner female.

➔ *Hemo-dynamics:*

- Pressure in proximal part of the aorta is high → left ventricular hypertrophy and high blood pressure in the upper part of the body.
- Pressure in distal part of the aorta is low → low blood pressure in the lower part of the body.

➔ *Clinical picture:*

A. Symptoms:

- **Mild:** Asymptomatic.
- **Severe:** Symptoms of hypertension in the head (headache, blurring of vision)
- **Symptoms of complications** of hypertension as heart failure, intracranial hemorrhage.

B. Signs:

1. General Examination:
   - Weak or absent femoral pulse.

- Radio-femoral delay (passage of blood through collateral circulation between branches of subclavian artery, descending aorta & femoral artery to bypass the obstruction).
  "Routine palpation of femoral pulse is essential in pediatrics".
- Radial pulse is prominent.
- Low blood pressure in the lower limbs.
- High blood pressure in the upper limbs (right arm)

2. Cardiac examination:

i. Inspection & palpation:

- Left Ventricular hypertrophy.
- No thrill.

ii. Auscultation:

- **Accentuated A2** (normal aortic valve).
- **Ejection Systolic murmur** over the back (between the 2 scapula) and over the upper left sternal border.

N.B. Always write sounds before murmurs

➔ *Complication of severe cases:*

1. Heart failure.
2. Sudden death.
3. Infective endoarteritis.
4. Intracranial hemorrhage.

➔ *Investigations:*

1. *CXR:*
   - Left ventricular hypertrophy
   - Rib notching due to dilated collaterals running under the ribs (in adolescent and adult).
2. *ECG:*
   Left ventricular hypertrophy.
3. *Echo & Doppler:*
   - **Diagnostic**
   - Echo assesses pressure gradient for intervention.
4. *Spiral C.T.:*
   Is Now **more preferred** to assess the exact affected area.

➔ *Treatment:*

1. Trans-catheter stent insertion.
2. Resection of narrow segment & anastomosis (surgical).
3. Graft insertion.

---

4. Describe the treatment of hypercyanotic spells in infants with Fallot's tetralogy.

Usually transient; treated if lasted more than 15 minutes.

1. Squatting (knee chest position): pressure on femoral artery increases systemic resistance, decreases right-to-left shunt & increases pulmonary flow.
2. Sedation & pain relief: Morphine maybe needed.
3. Oxygen & IV fluids.
4. Bicarbonate: for acidosis.

5. IV Propranolol: relieves sub-pulmonary muscular obstruction.
6. IV alpha agonist: increases systemic resistance (vasoconstriction).
7. Mechanical ventilation: maybe needed.

---

5. Describe the clinical picture of Fallot's tetralogy.

A. Symptoms:

1. Bluish discoloration of nails, lips & finger tips (1-3 months).
2. In mild cases, symptoms appear only with exercise.

B. Signs:

1. General examination:

a. Central cyanosis:
- Delayed to the age of 1-3 months due to gradual narrowing of the infundibulum & closure of ductus arteriosus.
- May appear in neonatal period in severe cases.
- Maybe absent in mild stenosis (Pink Fallot).

b. Hypercyanotic spells with squatting:
Deep attacks of cyanosis with crying or feeding.

c. Clubbing of fingers:
May develop after 1-2 years (anoxic clubbing).

d. Dyspnea:
Increases during cyanotic spells.

2. Cardiac examination:

I. Inspection & palpation:
- No cardiomegaly; only mild right ventricular hypertrophy.
- Systolic thrill over pulmonary area.

II. Auscultation:
- Ejection harsh systolic murmur heard at the pulmonary area.
- During a hypercyanotic spell, the murmur will be very short or inaudible.
- Single second heart sound (pulmonary component is too weak to be heard).

C. Complications:

1. **H**ypercyanotic spells:
   a. Precipitated by crying-infection-effort-iron deficiency.
   b. Pathology: spasm of infundibulum with decreased pulmonary flow & increased right to left shunt.
   c. Clinical picture:

- Usually transient cyanosis & severe dyspnea for 15 minutes to 1 hour.
- If prolonged → hypoxia with severe metabolic acidosis will develop.
- This creates a vicious circle that leads to more hypoxia, convulsions & death.

2. **H**eart failure is uncommon.
3. Polycythemia & hyperviscosity.
4. Thromboembolism (hemiplegia & cerebrovascular stroke).
5. **B**rain abscess.
6. **B**acterial endocarditis (endoarteritis).

7. Iron deficiency anemia.

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6. Differentiate between Fallot's tetralogy & transposition of great arteries.

P.O.C.	Fallot's tetralogy	Transposition of great arteries
Incidence:	- Most common congenital cyanotic heart disease. - 5% of all congenital heart diseases.	- 5% of all congenital heart diseases.
Defect:	1. Large VSD. 2. Pulmonary stenosis (infundibular, rarely valvular). 3. Overriding of aorta "receives blood from right & left ventricles". 4. Right ventricular hypertrophy (mild).	Aorta arises from right ventricle & pulmonary artery arises from left ventricle.
Hemodynamics:	a. When right ventricle contracts in presence of pulmonary stenosis, blood is shunted to the overriding aorta (central cyanosis). b. Mild right ventricular hypertrophy due to pulmonary stenosis. c. No shunt across the VSD because pressure is equal in both ventricles.	Two parallel isolated circulations: 1. Systemic venous blood returns to the right atrium & ventricle and to the body via the aorta. 2. Pulmonary venous blood returns to the left atrium & ventricle via pulmonary artery back to the lung. - Unless there is a mixing defect (PDA/ASD/VSD), the condition is incompatible with life. - Large mixing defect shows less severe symptoms.
General examination:	1. Central cyanosis (with bluish discoloration of nails, lips & finger tips): - Delayed to the age of 1-3 months due to gradual narrowing of the infundibulum & closure of ductus arteriosus. - May appear in neonatal period in severe cases. - Maybe absent in mild stenosis (Pink Fallot) and appears only with exercise or crying. 2. Hyper cyanotic spells with squatting: Deep attacks of cyanosis with crying or feeding. 3. Clubbing of fingers:	1. Deep central cyanosis at birth (severe & life threatening): - Cyanosis becomes more prominent over 1-2 years due to duct closure. - Cyanosis is deep even with 100% oxygen (hyperoxia test). 2. Severe dyspnea. 3. Repeated chest infection. 4. Clubbing in survivors before the age of 1 year.

	May develop after 1-2 years. 4. Dyspnea: Increases during cyanotic spells.	
Cardiac examination:	*I. Inspection & palpation:* - No cardiomegaly; only mild right ventricular hypertrophy. - Systolic thrill over pulmonary area. *II. Auscultation:* - Ejection harsh systolic murmur heard at the pulmonary area. - During a hypercyanotic spell, the murmur will be very short or inaudible. - Single second heart sound (pulmonary component is too weak to be heard).	*I. Inspection & palpation:* Enlarged right ventricle (huge). *II. Auscultation:* - **No heart murmur** due to lesion (systolic murmurs are due to associated mixing defect). - Loud and **single S2** (aorta lies anterior to pulmonary artery).
Complications:	1. **H**yper cyanotic spells: a. Precipitated by crying-infection-effort-iron deficiency. b. Pathology: spasm of infundibulum with decreased pulmonary flow & increased right to left shunt. c. Clinical picture: - Usually transient deep cyanosis & severe dyspnea for 15 minutes to 1 hour. - If prolonged, hypoxia with severe metabolic acidosis will develop. - This creates a vicious circle that leads to more hypoxia, convulsions & death. 2. **H**eart failure is uncommon. 3. Polycythaemia & hyper viscosity. 4. Thromboembolism (hemiplegia & cerebrovascular stroke). 5. **B**rain abscess. 6. **B**acterial endocarditis (endoarteritis). 7. Iron deficiency anemia.	1. Heart failure is common. 2. Hypoxia & arrest with duct closure. 3. Chest infection. 4. Failure to thrive. 5. Polycythemia & thrombosis.
Investigations:	*1. Laboratory:* - **CBC:** polycythemia (high Hb &	*1. Chest x-ray:* **Egg on sides shaped heart:**

	hematocrit value)-microcytosis. - **ABG in spell**: acidosis-hypoxia. 2. *Chest x-ray:* Boot-shaped heart (Coeur en Sabot shaped): normal C/T ratio, uplifted apex, acute cardiophrenic angle, exaggerated cardiac waist & lung oligemia. 3. *ECG:* **Right** ventricular hypertrophy & right axis deviation. 4. *Echo:* Shows tetralogy components. 5. *Catheter:* Detailed anatomy of pulmonary arteries before surgery.	- Narrow pedicle (narrow upper mediastinum). - Enlarged right ventricle & right atrium. - Acute cardio phrenic angle. - Pulmonary plethora. 2. *ECG:* Not helpful (right ventricular hypertrophy). 3. *Echo:* **Diagnostic.**
Treatment:	1. *Medical treatment:* - **Prostaglandin infusion**: in duct-dependent congenital cyanotic heart disease. - **Iron therapy**: for prevention of iron deficiency due to hyperactive bone marrow (it precipitates spells). - **Partial exchange transfusion**: in severe polycythemia. - **Treatment of cyanotic spells**: (usually transient; treated if > 15 minutes) a. Squatting (knee chest position): pressure on femoral artery increases systemic resistance, decreases right-to-left shunt & increases pulmonary flow. b. Sedation & pain relief: Morphine maybe needed. c. Oxygen & IV fluids. d. Bicarbonate for acidosis. e. IV Propranolol: relieves sub-pulmonary muscular obstruction. f. IV alpha agonist: increases systemic resistance.	1. **Prostaglandin infusion:** immediately at birth to maintain ductus arteriosus patent. 2. **Urgent shunt (Rashkind balloon atrial septostomy):** to allow good mixing of blood after birth (in 1st day of life). 3. **Total correction (arterial switch):** at 1st 3 weeks of life, arteries are switched above the valves & the coronaries are implanted in the new position in the aorta.

	g. Mechanical ventilation maybe needed. *2. Surgical treatment:* **a. <u>in deeply cyanosed neonate</u>** - **<u>Palliative shunt (Modified Blalock Taussig shunt operation):</u>** insertion of artificial tube between subclavian & pulmonary arteries which increases pulmonary circulation until baby is old enough for total correction. b. **<u>Total correction:</u>** At the age of 6 months. Close the shunt + patch closure of VSD + dilation of the narrow pulmonary artery.	

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7. Discuss Jones criteria for diagnosis of rheumatic fever.

➔ *Definition of rheumatic fever:*

Autoimmune inflammatory disease involving mainly the heart, joints & less frequently the central nervous system (basal ganglia), skin & subcutaneous tissues.

➔ *Etiology:*

- Follows infection with group A Beta hemolytic streptococci of the pharynx (not skin) i.e. streptococcal sore throat or scarlet fever.
- A latent period of 2-4 weeks is present between throat infection & onset of rheumatic fever.
- 4 months latent period in isolated rheumatic chorea.

➔ *Pathogenesis:*

- **<u>Cross reactivity theory:</u>** antibodies formed against streptococcal antigen can cross-react with cardiac muscles.
- **<u>Antigen similarity theory:</u>** group A strept. antigen is similar to cardiac valve antigens.

➔ *Jones' diagnostic criteria:*

A. Major criteria:

<u>2C ANE</u>

1. Poly**<u>A</u>**rthritis.
2. **<u>C</u>**arditis.
3. **<u>C</u>**horea.
4. **<u>E</u>**rythema marginatum.
5. Subcutaneous **<u>N</u>**odules.

B. Minor criteria:

<u>2P 3A 1E</u>

1. **<u>P</u>**yrexia: usually present at the onset (at least 38^0C).
2. **<u>P</u>**revious rheumatic fever.

3. **P**rolonged PR interval (inflammation leads to slower conduction, not specific for acute rheumatic fever).
4. **A**rthralgia: joint pain without objective findings of arthritis.
5. **A**cute phase reactants: raised (ESR-CRP) & leukocytosis.
6. **E**pistaxis (antibodies attack blood vessels).

C. *Evidence of recent streptococcal infection:*

"افتكر كلام د. مرعي: بندور على بكتيريا/جزء منها/أو antibody ضدها".

1. Recent scarlet fever.
2. Positive throat culture.
3. Anti-streptococcal antibodies (high titer): Anti-streptolysin O (ASOT), Anti-streptokinase & Anti-hyaluronidase.

➔ *Diagnosis of rheumatic fever is based on revised Jones criteria:*

- Presence of 2 major criteria or 1 major & 2 minor criteria Plus evidence of recent streptococcal infection.

➔ *The following tips are important in applying Jones criteria:*

- **Diagnosis** based on 2 major criteria is stronger than that based on 1 major & 2 minor.
- **Arthralgia** can't be considered a minor manifestation if arthritis is a major one.
- **Prolonged PR interval** can't be considered a minor criterion if carditis is a major one.
- **Acute phase reactants** (elevated ESR-CRP/leukocytosis) are all one minor criterion.
- Evidence of **recent** streptococcal infection is essential for diagnosis.
- ASOT titer (> 200) is **more reliable** than rapid detection of streptococcal antigen in throat culture (doesn't differentiate between recent infection & chronic pharyngeal carrier state).
- Patients with recurrent rheumatic attacks or isolated chorea may not fulfill the whole Jones criteria.

➔ *Discussion of major criteria:*

1. *Polyarthritis:*
   - The most common presentation (**70%** of cases).
   - **Polyarticular**: affects more than one joint.
   - Asymmetrical.
   - **Large joint** affection: knee, ankle, wrist, elbow & less commonly the hip.
   - The affected joint is **red, hot, tender, swollen** with limitation of movement.
   - **Migratory (fleeting**): migrates from one joint to another (one joint is improving while the other one becomes worse).
   - Shows **dramatic response to salicylates** (in 48 hours).
   - Leaves the joint **completely free** (no permanent deformity).
   - **Joint improves spontaneously** in 1 week but fleeting lasts for 1-2 months.
2. *Carditis:*
   - The second most common presentation after arthritis **(50%).**
   - It's usually **pancarditis** (most serious).

   A. *Endocarditis:*
      - Left side valves: mitral valve affection is more frequent than aortic valve (but both maybe affected together).
      - Mitral valve stenosis is the most common (maybe regurge or double lesion).
      - Acute stage: valve edema.

- Mitral valve regurgitation (pan systolic murmur at the apex): present in acute stage. In chronic stage, scarring of mitral valve may lead to stenosis (mid diastolic murmur at the apex): Carey coombs murmur.
- Aortic valve regurgitation is detected by early diastolic murmur along the left sternal border (isolated aortic valve affection is rare). Scarring → stenosis.

B. Myocarditis:

- Tachycardia disproportionate to age & fever.
- Muffled heart sounds.
- Rare to develop cardiomegaly or heart failure (may occur in severe cases).

C. Pericarditis:

- Precordial chest pain.
- Rare to show pericardial rub (or effusion) by auscultation.

NB: Carditis is the most serious manifestation of rheumatic fever as it maybe fatal during the acute stage and later on it may lead to chronic valve lesions.

3. Rheumatic chorea (Sydenham's chorea):

- 15% of cases.
- More common in females.
- Occurs much later than other rheumatic manifestations (latent period following streptococcal pharyngitis maybe as long as 4 months).
- Associated with other rheumatic manifestations in 10% of cases (usually with carditis).
- It maybe the only manifestation of rheumatic fever (isolated rheumatic chorea).
- Subsides gradually in 4-18 months, usually without permanent neurological sequelae (self-limited condition).

➢ *Manifestations include:*

A. Choreic movements of limbs, face & tongue (dysarthria):

- Involuntary Irregular.
- Static Sudden.
- Rapid Jerky Coarse.
- Purposeless Proximal more than distal.
- Increase by excitement & decrease by sleep.

B. Hypotonia:

- Pendular knee jerk.
- Darting tongue: tongue can't be maintained protruded.
- Inability to maintain extended arms or hand grip:
  - Choreic hands: when rising extended arms above head, there's flexion of wrists & extension of fingers.
  - Milkmaid's grip: squeezing and relaxation on hand shake.

C. Emotional liability:

- Mood swings & school problems.

4. Erythema marginatum:

- Less than 10%.
- Red non-pruritic macules that spread outwards & fade centrally.
- Appears over the trunk (map-like), legs, but never on the face.

- Disappears on exposure to cold & reappears after a hot bath.

5. *Subcutaneous nodules:*
   - 2-10%.
   - Small, rounded, hard, painless, non-pruritic & freely movable.
   - Present over bony prominences (extensor surface of large & small joints, mainly elbow).
   - Never present alone.

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8. How can you prevent recurrence of rheumatic fever?

Prevention of rheumatic fever:

1. *Primary prevention:*
   a. **Prevention** of streptococcal infection: e.g. proper ventilation (avoid crowdedness) & good hygiene.
   b. **Early diagnosis** of streptococcal pharyngitis. **Tonsillectomy** for frequent recurrence.
   c. Adequate treatment by single injection of **Benzathine penicillin** 1,200.000 IM or oral course of penicillin for at least 10 days (**Erythromycin** 40 mg/kg/day or cephalosporin in those allergic to penicillin).
   d. Primary prevention is difficult as 30% of streptococcal pharyngitis patients are asymptomatic (subclinical).
2. *Secondary prevention: prevention of rheumatic activity in patients with previous rheumatic fever.* = ***Prevention of recurrence***
   a. **Benzathine penicillin** 1,200.000 IM every 2 weeks in winter & every 3 weeks in summer (the best):
      – For life in patients with residual heart disease or artificial valve.
      – To the age of 18 years or 5 years duration in patients with no cardiac affection.
      – To the age of 25 years in patients with documented carditis.
   b. Other methods (not effective):
      – **Oral penicillin V** (250 mg, twice daily) or **sulphadiazine** (0.5 gm, once daily) or erythromycin (250 mg, twice daily in penicillin-sensitive patients).

Treatment:

A. Supportive treatment:
   – **Rest:** patients with carditis should have absolute rest in bed for at least 4 weeks + daily examination.

B. Specific treatment:

1. Arthritis:
   – **Salicylates (Aspirin):** 100 mg/kg/day in 4 divided doses for 2 weeks
   – Then 75 mg/kg/day for another 2-3 weeks.

2. Carditis:
   – **Prednisone** 2 mg/kg/day in 4 divided doses for 2 weeks, then taper gradually (decrease the dose by 25% each week) for 4-8 weeks.
   – **Salicylates** 75 mg/kg/day: overlapping therapy (during tapering) for 6 weeks to avoid post steroid relapse.

3. Chorea:
   – **Phenobarbitone**: 15 mg/kg/day.

Or:

- **Haloperidol:** 0.5 mg to 2 mg/day.

4. *Antibiotic therapy:*
   - **IM Benzathine penicillin** 1,200.000 IU (Erythromycin 40 mg/kg/day in those allergic to penicillin).

C. *Treatment of complications (heart failure):* see emergency.

a. Preload reducing agents:
- Diuretics as Furosemide 2 mg/kg/day.

b. Inotropes:
- Digoxin used with caution. Begin with half the usual dose (some patients with rheumatic carditis are supersensitive to digitalis leading to arrhythmia).
  - Digitalizing dose: 0.05 mg/kg.
  - Maintenance dose: 0.01 mg/kg/day.

c. Afterload reducing agents:
- Vasodilators as Captopril 2 mg/kg/day.

d. Follow up for possibility of development of rheumatic heart disease (RHD) by echo.

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9. Mention the diagnostic criteria, clinical manifestations & differential diagnosis of acute rheumatic fever.

Diagnostic criteria & clinical manifestations:

➔ *Jones' diagnostic criteria:*

A. Major criteria:

2C ANE

1. Poly**A**rthritis.
2. **C**arditis.
3. **C**horea.
4. **E**rythema marginatum.
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NB: Carditis is the most serious manifestation of rheumatic fever as it maybe fatal during the

acute stage and later on it may lead to chronic valve lesions.

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   - 15% of cases.
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   - Pendular knee jerk.
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   - Inability to maintain extended arms or hand grip:
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c. *Emotional liability:*
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e. *Subcutaneous nodules:*
   - 2-10%.
   - Small, rounded, hard, painless, non-pruritic & freely movable.
   - Present over bony prominences (extensor surface of large & small joints, mainly elbow).
   - Never present alone.

➔ *Investigations:*

1. *Laboratory:*

a. Evidence of recent streptococcal infection:
   - **Anti-streptolysin** O titer over 200 units (normal: below 150 Todd units).
   - **Other antibodies**: anti-streptokinase & anti-hyaluronidase.
   - **Throat swab** is usually **negative** (organism disappears from pharynx).

b. Presence & degree of inflammation (acute phase reactants):
   - **Erythrocyte sedimentation rate (ESR):** (normal: 1st hour 3-7 mm per hour. 2nd hour 8-15 mm per hour).
     Values more than 50 mm/hour are suggestive of rheumatic fever.
   - **C-reactive protein (CRP):** (normal: less than 10 mg/L).
   - **CBC**: leukocytosis.

c. Investigations are normal in isolated chorea due to long latent period.

2. *Imaging:*

a. ECG:
   - Prolonged PR interval.

b. X-ray:
   - Cardiomegaly maybe present.

c. Echocardiography:
   - Detect valvular lesions.
   - Assess myocardial contractility.
   - Exclude possibility of pericardial effusion.

➔ *Differential diagnosis:*

1. *Arthritis:*

From other causes of arthritis (see rheumatology).

2. *Carditis:*

From other causes of carditis (e.g. viral myocarditis).

3. *Chorea:*

From other causes of chorea (e.g. drug-induced chorea).

4. *Other causes of heart failure* as congenital heart diseases & myocarditis.

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10. Other points in rheumatic fever.

➔ *Incidence & Predisposing factors:*

- Most common acquired heart disease in children.
- Age: between 5-15 years (any age except infancy).
- Sex: chorea is more common in females.
- Family history.
- Low socioeconomic status (overcrowding & poor sanitation).

➔ *Pathology:*

Inflammation is either:

- Exudative (as in joints): resolve with no residual damage.
- Proliferative with Aschoff nodules: heal by fibrosis (heart).

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11. What is the treatment of infective endocarditis?

A. Prevention:

1. Proper oral hygiene is the most important factor.
2. Antibiotic prophylaxis prior to dental procedures:
   - Amoxicillin 50 mg/kg oral 30-60 minutes before the procedure.

- If penicillin sensitive:
  Clindamycin 20 mg/kg oral – IV – IM.
  Azithromycin 15 mg/kg oral.

B. Treatment:

1. Medical (Prolonged parenteral therapy):

To kill all the bacteria in vegetations.

- *Penicillin sensitive streptococcal endocarditis on native cardiac valves:*
  - Penicillin G for 4 weeks.
  - or Penicillin or Ceftriaxone combined with gentamycin for 2 weeks.
- *Penicillin resistant streptococcal endocarditis on a native valve:*
  - Ceftriaxone or Penicillin or Ampicillin for 4 weeks + gentamicin for the first 2 weeks.
  - Vancomycin if penicillin or ceftriaxone are not tolerated
- *In prosthetic valves:*
  - Add extra 2 weeks duration to the main antibiotic (6 weeks).

2. Surgical:

- *Absolute indications:*
  - Progressive cardiac failure.
  - Worsening valve obstruction.
  - Perivalvular abscess.
  - Pseudomonas infection.
  - Fungal infection.
- *Relative indication:*
  - Persistent bacteremia.
  - Vegetations > 10 mm.

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12. Describe the clinical picture of infective endocarditis.
Enumerate the modified Duke criteria used in diagnosis of infective endocarditis.

➔ *Definition:*

Microbial infection of the endothelial surface of the heart that needs high degree of suspicion to make an early diagnosis.

➔ *Etiology:*

1. Gram positive cocci:

- Alpha haemolytic streptococci (streptococcus viridans) is the commonest .
- Followed by: staphylococcus aureus, and coagulase negative staphylococci.

2. Gram negative bacilli: (HACEK organisms):

- **H**emophilus, **A**ctinobacillus, **C**ardiobacterium, **E**ikenella and **K**ingella esp. in neonates & immunocompromised.

3. E-coli is rare but dangerous (highly resistant to antibiotics).

4. Fungal endocarditis is a severe disease with poor prognosis & complications.

➔ *Predisposing factors:*

1. **T**ooth extraction.
2. **T**onsillectomy or adenoidectomy or GIT surgery.
3. **C**ardiac catheterization.
4. **C**entral venous catheters (esp. in neonates).

5. IV drug use.

➔ *High risk conditions:*

1. Cardiac lesions (75% of cases):
   - Congenital heart disease or rheumatic heart disease.
   - Residual cardiac defect (post-surgical).
2. Surgical shunts and conduits.
3. Prosthetic valves.
4. Previous episode of bacterial endocarditis.
5. Cardiac transplantation.
6. Premature (prolonged hospitalization, frequent use of catheters & frequent intervention): infective endocarditis can occur even in normal heart.

➔ *Pathophysiology:*

1. Endocardial damage by **turbulence** of blood flow across stenotic or incompetent valve or abnormal shunt, or by direct damage by catheters "**Denuded** endothelium".
2. Vegetation formation:
   - **Platelets & fibrin** adhere to the raw area in the endocardium (thrombus formation).
   - **Circulating bacteria** and inflammatory cells adhere to and grow in these thrombi, forming infected vegetations.
3. Vegetation fragmentation:
   - Leading to systemic **embolization** to any organ in the body (septic emboli phenomena as osteomyelitis, pneumonia & meningitis).
4. **Immune complex formation**:
   - Vasculitis & deposition on various endothelial surfaces (inflammation, rash & hemorrhages).

➔ *Diagnosis:*

Modified Duke criteria:

- 2 major.
- or 1 major + 3 minor.
- or 5 minor criteria.

A. Major Criteria:

1. +ve blood culture meeting the following criteria:

- 2 +ve culture of 3 cultures 24 hours apart.
- Typical organisms known to cause endocarditis, including strept, staph or HACEK group (hemophilus, actinobacillus, cardiobacterium, Eikenella and Kingella species).
- NB: atypical organism(fungi or E-coli) = minor criterion.

2. +ve Echo: better by transesophageal echo cardiography for:

- New vegetation or abscess.
- New valve regurge.

B. Minor Criteria:

1. Predisposition (history of congenital heart disease or IV drug use or … etc.).

2. Fever: with temp. more than 38°C:

- Infective endocarditis should be suspected in any cardiac lesion with unexplained fever.

3. Vascular phenomena (Arterial emboli):

- Splenic infarction.

- Cerebral infarction (stroke or intracranial haemorrhage).
- Renal infarction (hematuria).
- Retinal infarction.
- Necrotic skin or gangrene.
- Limb infarction (absent pulse).

4. *Immune complex deposition:*

a. Roth spots:
- Retinal and sub conjunctival haemorrhage with clear center

b. Splinter hemorrhage:
- Linear hemorrhage under the nail.

c. Osler nodules:
- Painful small nodules usually on the bulb of the finger.

d. Janeway lesions:
- Painless hemorrhagic lesions with necrotic center in the palm and soles.

e. Petechiae

f. Glomerulonephritis

5. *+ ve blood culture for atypical organism*

Other manifestations:

- Arthralgia.
- Anemia.
- Clubbing.
- Splenomegaly.
- Cardiac examination: change in character of a murmur.
- The most serious complication is acute heart failure (perforation of a valve)

Other investigations:

- CBC: leukocytosis.
- ++ ESR & CRP.
- Positive rheumatoid factor.

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13. Discuss the diagnosis, investigation and management of infective endocarditis.

See before.

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14. Define pediatric hypertension, mention causes, clinical picture, diagnosis and treatment.

➔ *Definition:*

Systolic or diastolic blood pressure greater than 95th percentile for age & sex on 3 or more occasions.

➔ *Stages of hypertension:*

- Normal < 90th.
- Prehypertension: blood pressure 90: <95th.
- Stage 1 hypertension: blood pressure 95th:99th plus 5 mmHg.
- Stage 2 hypertension: blood pressure >99th plus 5 mmHg.

ملحوظة للفهم :
خط الـ٩٠ ← عالميا: لو فيه ١٠٠ طفل ← ٩٠ منهم تحت هذا الخط ، و٥ أكثر عرضة لارتفاع ضغط الدم و ٥ ضغطهم عالي.

➔ *Causes:*

1. *Renal hypertension:*
   - Renal parenchymal disease: nephritis, chronic renal failure & chronic pyelonephritis.
   - Renovascular: renal artery stenosis.
   - Renal tumors.
2. *Coarctation of aorta.*
3. *Endocrinal causes:*
   - Pheochromocytoma (catecholamines excess).
   - Cushing syndrome.
4. *Iatrogenic:*
   - Corticosteroid therapy.
5. *Essential hypertension.*
6. *Increased intracranial tension & pain.*

➔ *Clinical picture:*

A. Symptoms:

1. Symptoms of hypertension: headache-difficulty initiating sleep & day time tiredness.
2. Symptoms of cause in 2ry type: e.g. Nephritis: hematuria, oliguria & edema. Cushing: moon face.

B. Signs:

1. *Rule out secondary causes.*
2. *Measurement of blood pressure in pediatrics:*
   - Cuff width should cover about 70% of upper arm's length:
     Small cuff overestimates blood pressure, while large cuff underestimates blood pressure.
   - Cuff should encircle the arm completely.
   - Blood pressure should be recorded in at least 3 separate office visits with 1 week apart.
   - Blood pressure should be measured in both arms and a leg to rule out coarctation of aorta.

➔ *Investigations:*

تذكرهم من الcauses:

A. Laboratory:

1. Urine analysis & culture (pyelonephritis لو شاكك في).
2. Urea & creatinine (renal disease).
3. Lipid profile 'cholesterol-HDL-LDL-TGA (metabolic syndrome).
4. Fasting glucose (diabetes).
5. Hormonal profile.

B. Imaging:

1. Renal ultra sound.
2. Echocardiogram (coarctation)

➔ *Treatment:*

1. Life style modification "eat well and move well" is the initial treatment of choice.

2. Antihypertensive drugs:

Indications:

- Secondary hypertension (+ ttt of the cause).
- Poor response to life style modifications
- Stage 2 hypertension

Drugs:

- ACE-I & CCBs.

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15. Differentiate between innocent & organic heart murmurs (2009).

	Innocent murmurs	**Organic murmurs**
Definition	Murmurs not associated with structural (anatomic) or hemodynamic abnormality (Present in 30% of children below 5 years).	Murmurs associated with anatomic abnormalities.
Etiology	Turbulence of blood flow at the origin of great arteries (the great arteries arise from the ventricles at a slight angle and are relatively narrower than the respective ventricle from which they arise).	Turbulence of blood flow across a defect or abnormal valve.
History	Asymptomatic.	Cardiac symptoms are present.
Examination		
Thrill	No thrill.	Maybe present.
Sounds	Normal.	Normal, muffled or accentuated.
Murmurs	**Site:** Left sternal edge or below clavicle. **Area of propagation:** No propagation. **Character:** Soft (never harsh) faint (grade 1 or 2). **Timing:** Systolic (except venous hum which is continuous).	Any area. Characteristic propagation. Harsh or soft. Systolic or diastolic or continuous.
Investigations	**X ray, ECG & Echo:** Normal.	Abnormal.
Treatment	Reassurance.	Medical & surgical ttt.

➔ *Types of innocent murmurs:*

1. Classic vibratory murmur (Still's murmur): the commonest.
2. Physiological pulmonary flow murmur.
3. Venous hum.

OTHER TOPICS:

1. Congenital heart diseases.

➔ *Incidence:*

- 8/1000 live birth (with 10% associated non-cardiac abnormalities).
- 10% are complex (more than one cardiac anomaly).

➔ *Etiology:*

1. *Chromosomal anomalies:*
   - Down syndrome: endocardial cushion defect (atrioventricular canal defect)-VSD-ASD-Fallot.
   - Turner syndrome: coarctation of aorta or aortic stenosis.
   - Patau syndrome.
   - Edward syndrome.
2. *Polygenic inheritance (multifactorial):* ***the most common.***
3. *Maternal diseases:*

Maternal disease	***Possible cardiac abnormality***
Rubella infection:	Peripheral pulmonary stenosis, PDA.
SLE:	Complete heart block.
Diabetes mellitus:	Incidence increased overall.

4. *Maternal irradiation.*
5. *Maternal drugs:*
   - Warfarin: pulmonary stenosis.
   - Fetal alcohol syndrome: ASD or VSD.

➔ *Classification:*

Non-cyanotic (80%)	**Cyanotic (20%)**
Maybe asymptomatic.	Onset of cyanosis is variable.
Clinical differentiation is possible.	Clinical differentiation is impossible.
Investigations are needed.	Investigations are essential.
Some may not need surgery.	Surgery is inevitable.
With left to right shunt: VSD (30%). PDA (5-10%). ASD (5-10%). A-V canal (2%).	**With decreased pulmonary flow:** Fallot tetralogy (5%). Fallot like conditions. Pulmonary atresia.
With obstructive lesion: Pulmonary stenosis (7%). Coarctation of aorta (5%). Aortic stenosis (5%).	**With increased pulmonary flow:** TGA (5%). Truncus arteriosus. Single ventricle. Hypoplastic left ventricle.

➔ *Clinical picture:*

1. Antenatal cardiac ultrasound diagnosis (at 18-20 weeks of gestation).
2. Detection of heart murmur.
3. Cyanosis.

4. Heart failure & shock.

➔ *Complications:*

A. <u>Complications of left to right shunt (VSD, PDA, ASD: ostium primum):</u>

1. Chest infection.
2. Heart failure.
3. Infective endocarditis.
4. Reversal of shunt (Eisenmenger syndrome).

B. <u>Complications of obstructive lesions:</u>

➢ <u>Aortic coarctation:</u>

1. Sudden death.
2. Intracranial hemorrhage.
3. Heart failure.
4. Infective endocarditis.

➢ <u>Aortic stenosis:</u>

1. Sudden death.
2. Heart failure.
3. Infective endocarditis.

C. <u>Complications of congenital cyanotic heart disease:</u>

1. Polycythemia.
2. Thrombosis.
3. Brain abscess.
4. Failure to thrive.

D. <u>ASD special complications:</u>

1. Atrial fibrillation.
2. Right bundle branch block.

---

2. Discuss the diagnosis and treatment of atrial septal defect.

➔ *Defect:*

1. *Ostium secundum:*
   - In the site of fossa ovale.
   - 80% of ASD.
   - Less serious.
2. *Ostium primum:*
   - In the bottom of the septum.
   - 20% "less common".
   - More serious.
   - Maybe part of atrio-ventricular canal defect.
3. *Sinus venosus defect:*
   - Near SVC (associated with anomalies in pulmonary veins).

➔ *Incidence:*

- Ostium secundum defect represents 5-10 % of all congenital heart diseases.
- More common in females.

➔ *Hemodynamics:*

- Blood is shunted from left atrium to right atrium (pressure is higher in left atrium as right atrium is less muscular & easier to fill with blood).
- Flow through the defect depends on size of the defect & compliance of right ventricle.
- Right atrium & ventricle dilation (volume overload).
- Blood overflow passes to lung (congestion) through pulmonary artery, then goes back to left atrium.

➔ *Diagnosis:*

Clinical picture:

A. Symptoms:

1. Ostium secundum is usually asymptomatic in infants.
2. Uncommon in children but common in adolescents or in the 3rd or 4th decade (20s-30s).
3. Symptoms of complications: heart failure, pulmonary hypertension, and arrhythmia may occur in adults.

B. Signs:

1. Inspection and palpation: Normal heart or mild right ventricular enlargement (diffuse apex-shifted outwards). No thrill.
2. Auscultation:
   - Wide fixed splitting of S2 sound (equal right ventricular stroke volume in both inspiration & expiration).
   - Soft ejection systolic murmur at the upper left sternal border (pulmonary area) dt. increased blood flow across pulmonary valve.
     NB: No murmur due to passage of blood across ASD.

➔ *Complications:*

1. Heart failure (delayed).
2. Right bundle branch block.
3. Atrial fibrillation.
4. Recurrent chest infection.

➔ *Investigations:*

A. Chest x-ray:

- Cardiomegaly (right ventricle dilation).
- Prominent pulmonary artery and pulmonary plethora in moderate to large ASD (it is a radiological term to describe the appearance of increased pulmonary perfusion in chest radiography).

B. ECG:

- Rt. ventricular enlargement, Rt. axis deviation, Rt. bundle branch block.

C. Echo (diagnostic):

- It shows position & size of the defect & blood flow across.
- It assesses the pulmonary pressure.
- It assesses cardiac dilation and efficacy of contractility.

➔ *Treatment:*

A. Medical:

1. If small asymptomatic → no treatment.

2. Treatment of complications & protection against infective endocarditis (discuss as before).

B. Surgical:

Trans-catheter closure by occlusion device or surgery between 3-5years → to prevent rt. sided HF and AF.

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3. Comparison between ostium primum and ostium secundum (ASD).

	Ostium primum defect	**Ostium secundum defect**
Site: *Incidence:* *Seriousness:*	In the bottom of septum. Less common. More serious.	In the site of fossa ovale. More common. Less serious.
Heart failure:	Occurs after 2-3 weeks of life.	Occur in adolescents or in 3rd and 4th decade "asymptomatic in infants".
Cyanosis:	May be seen in large defects.	Not seen.
Murmurs:	Apical pansystolic (from AV valve regurge in partial defects).	Soft ejection systolic at upper left sternal border dt. increased blood flow across the pulmonary valve.
Complications:	Occurs early (HF and pulmonary hypertension).	Occur late (HF).

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4. Ostium primum (atrioventricular) septal defect.

➔ *Incidence:*

Most common cardiac lesion in Down syndrome.

➔ *Pathology:*

- Defect in the middle of the heart with single five-leaflet valve between atria & ventricles which stretches across the entire atrio-ventricular junction & tends to leak.

➔ *Hemodynamics:*

<u>May be:</u>

1. <u>Partial: (ostium primum with MR)</u>
   - Right sided volume overload as ASD.
   - Left sided volume overload depending on MR "mitral regurge" degree.
2. <u>Complete: (ostium primum, VSD, MR, TR)</u>
   - Biventricular volume overload with early pulmonary hypertension.

➔ *C/P:*

1. Congestive heart failure after 2-3 weeks of life depending on size of defect.
2. Apical pan systolic murmur from AV valve regurge in partial AVC defect.
3. Mild cyanosis in large defects maybe seen dt. abnormal mixing of blood.
4. HF & pulmonary HTN occur very early.

➔ *Management:*

1. Medical ttt of heart failure & chest infection.
2. Surgical repair at 3-6 months of age (to prevent pulmonary hypertension that develops

early).

5. Comparison between aortic & pulmonary stenosis.

	Aortic stenosis	**Pulmonary stenosis**
Defect:	- Valvular: Most common – Deformity or **bicuspid** aortic valve. - Supravalvular. - Subvalvular: Fibrous or muscle hypertrophy in hypertrophic obstructive cardiomyopathy. - Associations: +/- Coarctation or MS.	- Mostly valvular. - Less common: Subvalvular & supravalvular.
Hemodynamics:	Left ventricular hypertrophy (pressure overload).	
Symptoms:	*Mild:* Asymptomatic. *Severe:* low cardiac output: - Chest pain. - Dizziness & dyspnea. - Exercise intolerance. - Syncope. *Very severe:* Neonatal HF & shock with duct dependent systemic circulation.	- Asymptomatic if mild. - Low cardiac output. - Cyanosis in severe cases with duct dependent pulmonary circulation.
General examination:	- Small pulse volume. - Low systolic blood pressure.	
Local examination:		
Inspection & palpation:	- Left Ventricular hypertrophy. - Systolic thrill over the aortic area (radiating to the apex & to the right carotid).	- Right ventricular hypertrophy. - Systolic thrill over the pulmonary area (left sternal border at 2nd left space).
Auscultation:	**- Ejection Systolic murmur** over aortic area (Rt 2nd intercostal space) & propagating to the neck. **- Delayed Weak Aortic component of the second heart sound.** - Ejection systolic click.	- Loud ejection systolic murmur over pulmonary area. - Weak pulmonary component of S2.
Complications:	- HF in infancy: in severe stenosis. - Sudden death. - Infective endoarteritis.	

Investigations:	<u>Chest X ray:</u> Left ventricular hypertrophy. Prominent ascending aorta (post stenotic dilatation). <u>ECG:</u> Left ventricular hypertrophy. <u>Echo & Doppler:</u> Diagnostic: determine pressure gradient across the valve. If > 50 mmHg: Intervention.	<u>Chest X-ray:</u> Prominent pulmonary artery (post stenotic). Right ventricular hypertrophy. <u>ECG:</u> Right ventricular enlargement. <u>Echo & Doppler:</u> Diagnostic & determine pressure gradient across the valve.
Treatment:	If the pressure gradient > 50 mmHg: - Balloon valvoplasty if mild. - Valvotomy if severe. - Valve replacement.	If the pressure gradient > 50 mmHg: - Balloon valvoplasty is 1st choice. - Valvotomy in severe cases. - Rarely, valve replacement.

6. Rheumatic heart disease.

	Mitral regurge (MR) ***"the most common"***	**Mitral stenosis (MS)**	**Aortic regurge (AR)**	**Aortic stenosis (AS)**
Pathology:	1. Dilation of left atrium & ventricle. 2. Pulmonary venous congestion. 3. Pulmonary HTN + right sided heart failure.	1. Rare in children (as it requires 5 to 10 years). 2. Thickening of the leaflets + calcification with immobility of the valve overtime. 3. Left atrium enlargement. 4. Pulmonary venous congestion. 5. Pulmonary hypertension & RVH.	Almost always associated with mitral valve disease.	
Clinical manifestations:	1. Exertional dyspnea & palpitation (Congestive HF). 2. Heaving	1. Dyspnea 2ry to pulmonary congestion. 2. Loud S1. 3. Rumbling mid-	1. Water hammer pulse & other peripheral signs of severe AR. 2. Hyperdynamic	1. Exertional dyspnea. 2. Chest pain (angina-type) & maybe syncope

	hyperdynamic apex (Lt. ventricular enlargement). 3. S1 is normal or diminished. 4. Apical harsh pansystolic murmur propagating to axilla.	diastolic murmur over the apex with presystolic accentuation. 4. Pulmonary HTN.	precordium + left sided apical impulse. 3. Soft blowing early diastolic murmur over the 2nd aortic area (3rd left sternal border).	or sudden death. 3. Heaving Lt. ventricular apical impulse. 4. Harsh ejection systolic murmur over upper right sternal border (1st aortic area) with propagation to neck.
Investigations:	1. Chest x-ray: LA & LV enlargement at varying degrees. 2. ECG: LV & LA hypertrophy. 3. Echo: Doppler studies can assess severity of regurge & degree of pulmonary artery pressure.	1. Chest x-ray: enlarged LA & RV + prominent pulmonary artery. 2. ECG: LA hypertrophy & later on right ventricular hypertrophy. 3. Echo.	1. Chest x-ray: cardiomegaly with left ventricular enlargement. 2. ECG: LVH. 3. Echo: Assess degree of AR & LVE.	1. Chest x-ray: LVH. 2. ECG: LVH. 3. Echo: assess degree of aortic valve stenosis & LVH.
Management:	1. Treatment of heart condition. 2. Surgical treatment: valve repair or replacement.	1. Treatment of heart failure & AF. 2. Balloon dilation in severe symptomatic cases. 3. Surgical ttt: mitral commisurotomy or replacement.	1. Treatment of heart failure (ACE inhibitors). 2. Surgical ttt: aortic valve repair or replacement.	Balloon or surgical valve repair or replacement.

➔ *Peripheral signs of aortic regurge:*

1. Head & neck:
   - Prominent carotid pulsation (*Corrigan sign*).
   - Head nodding (*De Musset sign*).
   - Systolic thrill over carotid arteries.

2. Upper limbs:
   - Water hammer pulse.
   - Increased pulse pressure.
   - Capillary pulsation (pressing on nail bed by finger → alternate rhythmic blanching and reddening) = *Quincke's sign.*
3. Lower limbs:
   - Pistol shot (over femoral artery): loud sound auscultated with each pulse.

- *Duroziez's sign*: systolic and diastolic murmur over femoral artery.
- *Hill sign*: blood pressure in lower limb is more than 50 mmHg more than upper limb (normally 20 mmHg).

IMPORTANT NOTES:

1- Most common congenital heart disease with Lt to Rt shunt → VSD.
2- Most common type of VSD → Membranous.
3- Most common type of ASD → Ostium secundum defect.
4- Most common cardiac lesion in Down syndrome → Ostium primum (AV canal).
5- Most common type of Aortic stenosis (&pulmonary stenosis) → Valvular.
6- Most common congenital cyanotic heart disease → Fallot`s tetralogy.
7- Coer en Sabot (Boot shaped heart) → Fallot.
8- Egg on side shaped heart → TGA (Transposition of great arteries).
9- Rashkind → Balloon atrial septostomy in TGA treatment.
10- Jones criteria → Rheumatic fever diagnosis.
11- Milkmaid`s grip, Darting tongue → Rheumatic chorea.
12- Most common Rheumatic heart disease → Mitral Regurge.
13- Duke criteria → Infective endocarditis.
14- Roth spots, Osler nodules, Janeway lesions → Minor criteria in Infective endocarditis.

Hematology

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **List DD of microcytic hypochromic anemia.**
   List causes and DD of iron deficiency anemia.
   Mention clinical, laboratory diagnosis and treatment of iron deficiency anemia.
   How can you prevent iron deficiency anemia in infancy and childhood?

➔ *Incidence:*

The most common cause of anemia in infancy.

➔ *Causes:*

1. *Diminished stores:*
   a. Anemic mother with **deficient** iron supplementation.
   b. Premature and twins.
2. *Deficient dietary iron:*
   a. Prolonged breast feeding (low iron content but 50% absorbed).
   b. Cow milk (higher iron content but 10% absorbed).
   c. Protein energy malnutrition.
3. *Diminished absorption:*
   a. Chronic diarrhea.
   b. Malabsorption.
4. *Blood loss:*
   a. Chronic hemorrhage.
   b. Ankylostoma and schistosomiasis.
   c. Cow milk allergy.
5. *Increased requirements:*
   a. Adolescents (especially girls).
   b. Acute hemorrhage.

➔ *Clinical picture:*

1. *Onset:*
   Above 6 months (mainly between 9-24 months).
2. *General symptoms of anemia:*

- Pallor (nail bed –palm- lids)
- Cardiac manifestations: Tachycardia- murmurs – heart failure
- Dyspnea
- Easy fatigability

3. *Atrophic glossitis.*
4. *Poor appetite.*
5. *Poor concentration and behavioral abnormalities.*
6. *Spooning of the nails.*
7. *Pica (geophpagia):*

Eating unusual substances as dirt, mud, gravels.

8. *Palpable spleen in 15% of cases.*

➔ *Investigations:*

A. *Blood picture:*
   1. *Low Hb.*
   2. *Microcytic hypochromic anemia:*
      - MCHC < normal.
      - MCV < normal.
      - Color index = Hb% divided by (RBC × 2): it will be below 1.
   3. *Reticulocytic count:*
      - Normal.
      - Shows mild increase with therapy (good therapeutic test).

B. *Blood chemistry:*
   1. *Low serum iron:*
      < 50 mcg% (normal 90-150 microgram%).
   2. *Low serum ferritin:*
      < 10 ng (normal 30-150 nanogram/ml).
   3. *Increased iron binding capacity:*
      Normal: 250-350 microgram%.

C. *Detect the cause:*
   1. *Stool analysis:*
      Ankylostoma –blood in stool –bilharziasis.
   2. *Endoscopy:*
      To exclude peptic ulcer.

➔ *Differential diagnosis (other causes of microcytic hypochromic anemia):*

Disease	*Clinical picture*
Iron deficiency anemia	Pica.
Beta-thalassemia trait	No response to iron.
Chronic infection	Picture of infection.
Sideroblastic anemia	Improve with vitamin B6.
Lead poisoning	Manifestations of lead toxicity.

➔ *Prevention:*

1. Adequate supply of iron to **pregnant** female.
2. Making powdered **formula** well **fortified** with iron.
3. Prophylactic iron therapy to **premature**.
4. Proper **weaning** by supplying iron containing foods.
5. Treatment of the cause (e.g. ankylostoma).

➔ *Treatment:*

1. *Iron therapy:*
   a. Oral therapy:
      - Ferrous sulfate or gluconate.
      - Dose: **6 mg**/kg/day/3 doses in between meals for 2 months.
      - New preparations (no teeth stain – minimal GIT upset): e.g. sodium iron edetate.

b. Parenteral therapy:
   - I.M. iron dextran..
   - Dose: 50-100 mg daily for 5 days.

c. I.V. iron hydroxide in severe cases.

2. *Diet:*
   Rich in iron (meat, liver, green vegetables) & vitamin C.
3. *Treatment of the cause:*
   a. Schistosomiasis: Praziquantel.
   b. Ankylostoma; albendazole.
4. *Treatment of complications:*
   Packed RBCs transfusion only in heart failure.

By 1st day: reduced irritability, improved appetite.
By 2nd day: erythroid hyperplasia in bone marrow.
By 3rd day: reticulocytosis peaking at 5-7 days (good therapeutic test).
By 1st month: elevated hemoglobin 1/4 gm/dl/day.
4-6 weeks: increased stores.

---

2. State the causes of chronic hemolytic anemia.

➔ *Definition of hemolytic anemia:*
Decreased red blood cell life span due to increased rate of destruction (intravascular or extravascular hemolysis in liver or spleen). "Normal red blood cell life span is 120 days"

➔ *Causes of chronic hemolytic anemia:*

A. Hereditary (corpuscular):
1. Membrane defect:
   - Hereditary spherocytosis.
   - Hereditary elliptocytosis.
2. Hemoglobin defect:
   - Thalassemia (quantitative).
   - Sickle cell anemia (qualitative).
3. Enzyme defect:
   - G6PD deficiency (chronic type).
   - Pyruvate kinase deficiency.

B. Acquired (non-corpuscular):
Chronic autoimmune hemolytic anemia.

➔ *Pathophysiology:*

A. Increased RBC hemolysis:
Anemia → increased erythropoietin → bone marrow hyperplasia (disfigurement & reticulocytosis) + reticuloendothelial hyperplasia (hepatosplenomegaly & lymphadenopathy).

B. Hemosiderosis.

C. Elevated bilirubin → jaundice, dark urine on standing and bilirubin stones.

➔ *Clinical picture:*

A. Clinical picture of anemia: (PCDEF)

- **P**allor (nail bed, palm & lids).
- Ta**c**hycardia.
- **D**yspnea.
- **E**asy **f**atigue.
- Murmurs.
- Usually needs frequent blood transfusion.

B. Clinical picture of hemolysis: (5 colors)

- **Jaundice.**
- Attacks of **red** urine (hemoglobinuria).
- **Dark** urine on standing.
- **Dark** stool.
- **Bronzed** discoloration (takes years).

C. Organomegaly and disfigurement: (5 organs)

1. Hepatosplenomegaly with minimal lymphadenopathy:

- Destruction of abnormal RBCs.
- Formation of new RBCs (extramedullary hematopoiesis).
- Deposition of iron overload (hemosiderosis).
- N.B.

  Splenomegaly will result in hypersplenism with more severe anemia and pancytopenia.

2. Macrocephaly (mongoloid features of face):

- Caused by compensatory bone marrow action.
- Prominent zygoma, forehead, maxilla, with:
  - Depressed nasal bridge.
  - Prominent upper central incisors.
  - Separation of teeth.

3. Dilated heart & heart failure:

Due to tachycardia, relative hypoxia (anemia), or cardiomyopathy (due to hemosiderosis).

➔ *Investigations:*

A. To prove anemia:

CBC shows low hemoglobin.

B. To prove hemolysis:

1. Blood film:

   Reticulocytosis.
2. Blood chemistry:

   Elevated serum indirect bilirubin, serum iron, serum ferritin, with decreased iron binding capacity (IBC).
3. Increased urinary urobilinogen.
4. X-ray (of poor value):

   Bone marrow expansion:
   - Wide diploid space of the skull.

- Rarefaction of outer table.
- Increased trabecular pattern.

➔ *Complications:*

1. *Complications of long-term blood transfusion:*
   - Hemosiderosis.
   - 10% of cases show antibodies with difficulty to find compatible blood.
   - Infections (HBV, HCV, HIV, malaria).
   - Complications of venous access: infections & bleeding.
2. *Anemic heart failure.*
3. *Gall Bladder stones.*
4. *Crises: (Discussed later)*
   - Aplastic, hemolytic, sequestration crises.
   - Vaso-occlusive and infectious crises (in sickle cell anemia).
5. *Hemosiderosis (Deposition of iron in tissues):*

   Each 500 ml of blood deliver 200 mg of iron.
   - Endocrinal disturbances: delayed puberty, pituitary dysfunction & diabetes mellitus (bronzed diabetes).
   - Liver cirrhosis and liver failure.
   - Pulmonary hemosiderosis.
   - Cardiomyopathy.
   - Arthropathy.
   - Neuropathy.
6. *Easy Fracture of bones.*
7. *Growth retardation and delayed puberty.*
8. *Hypersplenism (mainly in thalassemia).*
9. *Autosplenectomy (in sickle cell anemia).*

---

3. List essential investigations for a suspected case of beta thalassemia.

➔ *Definition:*

- The commonest cause of chronic hemolytic anemia in Egypt.
- Autosomal recessive disorder characterized by defective synthesis of beta chains of globin.
- Two genes on chromosome 11:
  - Two gene mutation (homozygous): Thalassemia major (Cooley's anemia).
  - One gene mutation (heterozygous): Thalassemia minor.
  - Thalassemia intermedia: moderate severity.

Beta thalassemia major (Cooley's anemia)

➔ *Pathogenesis:*

- The body tries to switch to HbA at the age of 3-5 months but the gene of beta chain is defective → production of restricted amount of HbA.
- Then the body tries to reproduce HbF, but also its reproduction will be defective.
- Free alpha chain become insoluble and precipitate inside RBCs → hemolysis.

➔ *Clinical picture:*

Discuss as in chronic hemolytic anemia +

1. Onset: by the 2nd half of the 1st year.
2. Course: severe with frequent blood transfusion.
3. Complications:

Most liable for early complications and **early development of hypersplenism**.

"Discuss all complications of chronic hemolytic anemia except autosplenectomy, vaso-occlusive & infectious crises".

➔ *Investigations:*

1. To prove anaemia:

CBC shows: low hemoglobin.

2. To prove hemolysis:
   a. Blood film: reticulocytosis, microcytosis, anisocytosis, poikilocytosis and target cells.
   b. Blood chemistry: elevated serum iron, elevated serum ferritin and decreased iron binding capacity.
   c. Elevated serum indirect bilirubin.
   d. Urine analysis: increased urinary urobilinogen.
   e. Hemoglobin electrophoresis:
      – In affected child: HbF is markedly elevated (10-90%), reduced HbA levels.
      – In parents: high levels of HbA_2 more than 4% (normal: 3%).
3. We should also screen for suspected complications:
   a. Screening for blood borne infections (HCV, HIV, HBV).
   b. Abdominal US: for cholecystitis.
   c. Diabetes: blood sugar.
   d. For heart: echocardiogram.
   e. Liver function tests, … etc.

➔ *Prevention:*

Genetic counseling, carrier detection & prenatal diagnosis.

➔ *Treatment:*

1. *Supportive treatment:*
   - Iron restriction in diet.
   - Folic acid supplementations (1 mg /day).
   - Calcium and vitamin D.
   - Vaccination against HBV.
2. *Repeated packed RBCs transfusion:*
   - 10-15 ml /kg every month to keep the Hb level at 10-12 gm /dl (hypertransfusion).
   - It's important for good activity, better growth, reduce organomegaly and disfigurement.
3. *Iron chelating agents:*
   - **Desferal (desferroxamine):** by S.C. pump over 10 hours, 5 days per week (20 – 40 mg/kg).
   - Oral chelating agents:

- **Deferiprone** (100 mg\day).
- **Deferasirox** (10-20 mg\day).

4. *Splenectomy:*
   - Indicated if there is huge splenomegaly or hypersplenism.

- Avoided before age of 4 years.
- Splenectomy care:
  - Before surgery: patient should be vaccinated against capsulated organisms (pneumococci, meningococci and H. influenzae).
  - After surgery: patient should receive long acting penicillin prophylaxis till the age of 8 years.

5. *Bone marrow transplantation :*
   - It is curative (best below 3 years).
   - Prepared from bone marrow from HLA matching sibling.
6. *Gene therapy under trial (introduction of functioning gene).*
7. *Induction of fetal hemoglobin synthesis:*
   By using hydroxyurea.
8. *Treatment of complications:*
   - Cholecystectomy for gall stones.
   - Growth hormone for short stature.
   - Diabetes: insulin therapy.

Thalassemia minor

One gene mutation (heterozygous).

➔ *Clinical picture:*
- Most cases are asymptomatic.
- The condition is suspected when a patient with microcytic hypochromic anemia fails to respond to iron therapy.

➔ *Investigations:*
1. *Blood picture:*
   - Microcytic hypochromic anemia.
   - No obvious signs of hemolysis.
2. *Hemoglobin electrophoresis:*
   - Increased HbA_2 (minor adult Hb) > 4% (normal: 3%).

---

4. Crises of sickle cell anemia.
Describe complications of SCA & their management.

Sickle cell anemia

➔ *Definition:*
- One of the causes of chronic hemolytic anemia with formation of abnormal beta chain of hemoglobin.
- Autosomal recessive disease.
- Common in black race.

➔ *Genetics:*
Mutation in beta chain gene leading to replacement of amino acid number 6 in the chain (glutamic acid by valine).

A. Heterozygous (sickle cell trait)
   - Only 20-40% HbS.
   - Only presents with vaso-occlusive crisis with severe hypoxia.
   - Resistant to infection with falciparum malaria.

B. Homozygous (sickle cell anemia)

➔ *Pathogenesis:*

- Single amino-acid substitution in beta chain results in different hemoglobin **(HbS).**
- HbS is less soluble than HbA.
- With **hypoxia**, deoxygenated HbS polymerize inside RBCs leading to distortion of their shape (sickle-shaped) → easy destruction + occlusion of blood vessels.

➔ *Clinical picture:*

Discuss as in chronic hemolytic anemia +

1. Onset: by the 2nd half of 1st year.
2. Course: less severe than thalassemia.
3. Complications:

   Discuss as in chronic hemolytic anemia but no hypersplenism (autosplenectomy usually occurs) + crises (see later).

➔ *Investigations:*

1. *To prove anemia:*

   CBC shows low hemoglobin.

2. *To prove hemolysis:*

   a. Blood film:
   - Reticulocytosis.
   - Sickling (characteristic sickle shaped RBCs under low O_2 tension).

   b. Blood chemistry:

   Elevated serum indirect bilirubin, serum iron, serum ferritin, with decreased iron binding capacity (IBC).

   c. Increased urinary urobilinogen.

   d. X-ray (of poor value):

   Bone marrow expansion:
   - Wide diploid space of the skull.
   - Rarefaction of outer table.
   - Increased trabecular pattern.

   e. Hemoglobin electrophoresis:
   - HbS is present (> 90%).
   - No HbA.
   - Parents: HbS (20-40%), HbA (60-80%).

3. *Genetic study of affected gene.*

Crises

1. *Sequestration crisis*

➔ *Cause:*

For unknown cause, large amount of blood is acutely pooled in spleen and liver.

➔ *C\P:*

Shock – Liver and spleen enlargement – Acute anemia.

➔ *Treatment:*

I.V fluids – Packed RBCs transfusion – Splenectomy for recurrent cases.

2. *Hyper-hemolytic crisis*

➔ *Cause:*

Patient with sickle cell anemia + G6PD deficiency.

➔ *C\P:*

Acute anemia – Hemoglobinuria (dark urine).

➔ *Investigations:*

- Reticulocytosis.
- Enzyme assay later on.

➔ *Treatment:*

Packed RBCs transfusion.

3. *Aplastic crisis*

➔ *Cause:*

Infection by parvovirus B19 resulting in failure of erythroid serious.

➔ *C\P:*

Severe anemia (last 3-4 weeks).

➔ *Investigations:*

Reticulocytopenia.

➔ *Treatment:*

Packed RBCs (once or twice over 4 weeks).

4. *Vaso-occlusive crisis (VOC)*

➔ *Definition*:

- Painful crisis peculiar to sickle cell anemia.
- It may be the only presentation in sickle cell trait.

➔ *Cause:*

- Hypoxia – Infection – Dehydration – Acidosis all deoxygenated HbS.
- HbS polymerize within RBCs "sickling".
- RBCs express number of adhesion molecules & adhere to vascular endothelium.
- Obstruction of blood vessels occurs.

➔ *C/P:*

A. *Bony pains "hand-foot syndrome":*
   - Severe pain & swelling (ischemia of metacarpals and metatarsals).
   - Maybe the 1st presentation of SCA.

B. *Recurrent strokes:*
   Neurological defect & poor school performance.

C. *Acute chest syndrome:*
   Acute chest pain & fever due to pulmonary infarction.

D. *GIT ischemia:*
   Acute abdominal pain.

E. *Ischemic nephropathy.*

F. *Priapism:*
   Fibrosis & importance.

G. *Splenic infarctions (autosplenectomy):*
   So spleen is enlarged early then regresses gradually.

5. Infectious crisis

– In patients with SCA due to auto-splenectomy.
– Mainly by capsulated organisms.

➔ *Treatment of sickle cell anemia:*

1. Supportive (discuss as in thalassemia).
2. Blood transfusion & iron chelation (less frequent).
3. No need for splenectomy.
4. Treatment of vaso-occlusive crisis:
   a. Oxygen & IV fluids.
   b. **A**ntibiotics & **A**nalgesics
   c. **B**icarbonate "for acidosis".
   d. **B**lood transfusion (if Hb < 6 gm/dl).
   e. **C**omplete rest in bed.
   f. **E**xchange transfusion (in acute chest syndrome- stroke- priapism).

---

5. Acute hemolytic anemia.

➔ *Definition:*

Anemia caused by acute (sudden) and rapid destruction of RBCs in peripheral blood and in spleen.

➔ *Causes:*

1. *Hereditary (corpuscular):*
   G6PD deficiency (most common).
2. *Acquired (extra-corpuscular or extrinsic):*
   All acute except chronic autoimmune hemolytic anemia.
   A. Immunologic disorders (+ve Coomb):
      a. Rh & ABO incompatibility.
      b. Autoimmune hemolytic anemia:
         – Idiopathic.
         – Infections (as EBV, CMV & mycoplasma pneumonia).
         – Drug-induced (as methyldopa, penicillin).
         – Collagen vascular diseases (as SLE).
   B. Non-immunologic disorders:
      a. Sepsis.
      b. Malaria.
      c. Wilson disease.
      d. Artificial valve.
      e. DIC.
      f. Hemolytic uremic syndrome.

Glucose-6-phosphate dehydrogenase (G6PD) deficiency

➔ *Incidence:*

– Most common cause of hemolysis.
– Commonest RBC enzymopathy.
– Common in Middle East, middle Africa & Far East.

➔ *Etiology:*

- X-linked recessive (more common in males).
- Heterozygous female (carrier): 50% enzyme activity (appears normal).
- Females maybe affected if homozygous or with lionization.

➔ *Pathogenesis:*

- G6PD is the rate limiting enzyme in synthesis of NADPH & reduced glutathione.
- NADPH and reduced glutathione provide H^+ that protect hemoglobin against oxidation.
- G6PD deficiency result in deficiency of NADPH and glutathione.
- On exposure to oxidants → Hb becomes oxidized to methemoglobin → precipitate as Heinz bodies → hemolysis (mainly intravascular).

➔ *Clinical picture:*

1. History of **neonatal jaundice** (mild to very severe).
2. **History of exposure to oxidants:**
   a. Infection.
   b. Drugs:
      - Analgesics (Aspirin large dose, Novalgin).
      - Antibiotics (chloramphenicol, sulfonamides, quinolones).
      - Antimalarial drugs (primaquine, chloroquine, quinine).
   c. Chemicals:
      - Naphthaline.
   d. Food:
      - Fava beans, broad beans & peas.
3. Acute pallor with palpitation, dyspnea, irritability or drowsiness.
4. Acute jaundice.
5. Acute dark urine (hemoglobinuria) indicating high rate of hemolysis.

➔ *Complications:*

Acute heart failure.

➔ *Investigations:*

1. *CBC:*
   - Anemia (normocytic normochromic).
   - Reticulocytosis (hemolysis).
2. *Blood chemistry:*
   - Unconjugated hyperbilirubinemia.
   - Hemoglobinemia.
   - Hemoglobin in urine.
3. *Blood film:*
   - Fragmented RBCs.
   - Heinz bodies.
4. *Estimation of enzyme activity:*

   After 2 weeks of hemolytic attacks because immediately after hemolysis, bone marrow releases new RBCs and reticulocytes with normal enzyme level giving misleading normal results.

➔ *Treatment:*

1. Urgent packed RBC transfusion (10 ml/kg) is life saving in severe hemolysis.

2. Prevention of subsequent attacks:
3. A list containing oxidants must be offered to parents.

➔ *DD of causes of acute hemolysis:*

Disease	*Specific clinical picture*	*Specific investigation*
G6PD deficiency:	History of 1st intake of beans.	Heinz bodies. G6PD assay.
Autoimmune hemolytic anemia (AIHA):	- Drug intake. - Infection 2 weeks ago. - Associated arthritis or skin rash.	+ve Coomb's test.
Hemolytic uremic syndrome (HIS):	- History of severe gastroenteritis. - Acute renal failure.	- Thrombocytopenia. - Elevated renal function test levels.
Infection (malaria):	- Travelling to endemic area. - Pattern of fever.	Blood film is diagnostic.
Sepsis:	- Toxic patient (septicemia). - Purpuric eruption.	- CBC: leukocytosis, shift to left. - High ESR & CRP.

---

6. Aplastic anemia.

➔ *Definition:*

Aplasia of blood precursors in bone marrow that results in pancytopenia in peripheral blood.

➔ *Clinical picture:*

1. **Anemia** (Discuss).
2. **Purpura** (Discuss).
3. **Fever:**
   - Persistent & resistant to treatment.
   - Recurrent infections (esp. oral fungal infection).
4. **Specific picture of the cause**.

➔ *Investigations:*

1. Blood picture:
   Pancytopenia.
2. Bone marrow examination:
   Hypocellular bone marrow.

➔ *Causes:*

A. Congenital:

1. Fanconi anemia (most common).
2. Dyskeratosis congenital: with dysgenesis in skin & nails.

B. Acquired:

1. Idiopathic:
   The most common (70%).
2. Secondary to:
   a. Chemicals like benzene.

b. Chemotherapy.
c. Infections (EBV-HBV).
d. Exposure to radiation.
e. Exposure to toxins.
f. Drugs: chloramphenicol & sulfa.

➔ *DD of aplastic anemia:*

<u>Discussed in purpura.</u>

1. Leukemia.
2. ITP.

Fanconi anemia

➔ *Definition:*

Autosomal recessive disease with aplasia of blood precursors in the marrow that result in pancytopenia.

➔ *Clinical picture:*

1. <u>Onset:</u>
   After the age of 3 years (6-8 years in average).
2. Anemia, purpura and fever (discuss).
3. Skeletal associations in 50% of cases:
   Microcephaly, short stature, absent thumb, absent radius.
4. Mental retardation.
5. Skin pigmentation, renal malformation, micro-ophthalmia.

➔ *Investigations:*

1. <u>Blood picture:</u>
   Pancytopenia.
2. <u>Bone marrow examination:</u>
   Hypo-cellular bone marrow.
3. <u>Karyotyping:</u>
   Increased chromosomal breaks.
4. <u>Skeletal survey</u> for skeletal anomalies.
5. <u>Abdominal U/S</u> for renal malformation.

➔ *Treatment:*

1. <u>Supportive treatment:</u>
   - Controlling anemia: packed RBCs transfusion.
   - Infections: antibiotics.
   - Bleeding: platelets transfusion.
2. Prolong survival by **<u>A</u>ndrogens and <u>C</u>orticosteroid** therapy that stimulate bone marrow.
3. **<u>B</u>one marrow transplantation** is the treatment of choice.

Acquired aplastic anemia

➔ *Clinical features:*

1. <u>Onset:</u>
   Any age (acute onset) after certain event (drug, infection, ..) or idiopathic.
2. Anemia, purpura and fever (discuss).

➔ *Treatment:*

1. Mild cases:

   Anti-thymocyte globulin (ATG) or **C**yclosporine.
2. Severe cases:
   - **B**one marrow transplantation (BNT) is the treatment of choice from HLA matching sibling.
   - If not available → immunosuppressive therapy.

---

7. List clinical presentation & diagnosis of acute leukemia.

➔ *Definition:*

- It is a malignant proliferation of white cell precursors that occupy and inhibit BM.
- It is the most common form of childhood malignancies.

➔ *Risk factors:*

1. Genetic predisposition.
2. Chromosomal abnormalities.
3. Exposure to chemicals (benzene – pesticides) or radiation.
4. Viral infection and immunodeficiency.

➔ *Types of leukemia:*

A. Acute leukemia (95%):

1. Acute lymphoblastic leukemia (ALL):
   - **75%**
   - Good prognosis.
   - **2-5** years.
2. Acute myeloid leukemia:
   - **20%**
   - Poor prognosis.
   - **> 5 years.**

B. Chronic leukemia (5%):

1. No chronic lymphoblastic leukemia in children.
2. Chronic myeloid leukemia:
   - Philadelphia chromosome (t 9;22) +ve.
   - **Rare.**

➔ *C/P:*

A. Bone marrow failure:

1. Anemia: pallor, dyspnea, fatigue, tachycardia, murmurs.
2. Purpura and bleeding. (discuss clinical picture).
3. Recurrent infections (esp. oral fungal infection) with persistent fever resistant to treatment.

B. Infiltration:

1. Splenomegaly (2/3 of cases) and hepatomegaly.
2. Lymphadenopathy.
3. Joint & bony swelling.
4. Testicular infiltration and swelling.

5. CNS infiltration –(symptoms of increased ICT).

➔ *Investigations:*

A. Blood picture:

- Anemia.
- Thrombocytopenia.
- WBCs may be high, low or normal.
- The film may show **blast cells.**

B. Bone marrow biopsy:

Blast cells in acute lymphoblastic leukemia or myeloid precursors in acute myeloid leukemia.

➔ *Prognosis:*

Poor if WBCs count > 50.000/mm^3.

➔ *Treatment:*

1. Supportive ttt:
   - Controlling anemia: Packed RBCs transfusion.
   - Infections: Antibiotics.
   - Bleeding: Platelets transfusion.
2. Chemotherapy:
   - **Induction of remission**: Asparagenase- Vincristine- Prednisone- Cytarabine (*AVPC*)
   - **Intrathecal:** Methotrexate- Hydrocortisone- Cytarabine (*MHC*)
   - **Systemic continuation therapy** (2-3 years): 6 Mercaptopurine- Methotrexate (*MM*)
   - **Bone marrow transplantation** in relapsing cases.

---

8. Mention etiological classification of purpura.

➔ *Definition:*

Multiple spontaneous minute capillary hemorrhages, in the form of purplish petechiae & ecchymoses, in the skin or mucous membranes due to vascular or platelet defect (number or function).

➔ *Classification: According to platelets count:*

Normal: 150.000-450.000/mm^3

Mild thrombocytopenia: 50.000-150.000/mm^3

Moderate thrombocytopenia: 20.000-50.000/mm^3

Severe thrombocytopenia: <20.000/mm^3

i. Thrombocytopenic purpura (number of platelets is decreased):

1) Increased destruction (normal megakaryocytes):

a) Immune:
   - Immune thrombocytopenic purpura (ITP): the commonest cause.
   - Systemic lupus erythematosus (SLE).
   - Neonatal isoimmune or maternal ITP.

b) Non-immune:
   - **D**isseminated **I**ntravascular **C**oagulation (DIC).
   - Hemolytic uremic syndrome.
   - Hypersplenism.
   - Drug induced.

- Infections.

2) *Decreased production (decreased megakaryocytes):*

a) Bone marrow depression:

Congenital:

- Fanconi anemia (constitutional pancytopenia).
- **T**hrombocytopenia with **A**bsent **R**adii (TAR syndrome).

Acquired:

- Aplastic anemia (idiopathic, drugs, toxins or irradiation).
- Megakaryocytic aplasia (idiopathic or 2ry to drugs).

b) Bone marrow replacement (infiltration):

- Leukemia, lymphoma or metabolic disorders.

c) Deficiency:

- Congenital: thrombopoietin deficiency.
- Acquired: vitamin B_{12} & folic acid deficiency.

ii. Non-thrombocytopenic purpura (normal number of platelets):

1) *Vascular defect:*

a) **H**enoch-**S**chonlein **P**urpura (HSP): immune vasculitis.
b) Infections: as meningococcemia.
c) Scurvy (vitamin C deficiency).
d) Drugs.
e) Inherited: Ehlar-Danlos syndrome & Marfan syndrome.

2) *Platelet dysfunction (thromboasthenia):*

a) Drugs as **Aspirin**.
b) Systemic disorders as **uremia** (renal failure).
c) Inherited abnormal platelets: **giant platelet syndrome**.

NB: Describe clinical picture of diseases discussed in details in the chapter (ITP, Henoch-Schonlein, Fanconi anemia, …).

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9. Describe clinical picture & therapy of immune thrombocytopenic purpura (ITP). Mention characteristic laboratory findings in ITP.

➔ *Definition:*

- Acquired generalized hemorrhagic state due to marked destruction of circulating platelets by autoantibodies (in presence of active bone marrow & absence of hepatosplenomegaly or underlying disease).
- Most common cause of purpura.

➔ *Pathogenesis:*

Autoimmune destruction of platelets. Clinically present in 2 forms:

1) *Acute form (85-90%):*
   - Usually preceded by non specific viral illness or specific as rubella or rubella immunization.
   - The virus itself or through alteration of platelet antigenicity leads to formation of autoantibodies that react with platelets.
2) *Chronic form (10-15%):*
   - Persistence of clinical & laboratory findings for more than 12 months.

- Related to autoimmune disorders.
- Genetic factors may have a role.

➔ *Clinical picture:*

(acute onset, 1-2 weeks after viral infection), (age 2-10 years)

1) *Purpura:*
   - Nature: petechial hemorrhage (pin point) & less commonly ecchymoses.
   - Site: **generalized** over limbs, face & trunk.
   - Surface: **not raised** & **do not blanch** on pressure.
   - Color: purple in color when fresh, then change within days to green then brown, then fade (differentiate from insect bites).
   - Size: variable → petechiae (1-2 mm), purpura (>2 mm to 1 cm) or ecchymoses (more than 1 cm).
2) *Bleeding:*
   - Mucous membranes: epistaxis, bleeding gums, or hematuria.
   - Internal organs: intracranial hemorrhage in 1% of cases (most serious).
3) *Anemia:*
   - Maybe present in case of severe bleeding.
4) *Liver & spleen usually not enlarged.*

➔ *Differential diagnosis:*

1) *Aplastic anemia:*
   Pancytopenia & decreased all precursors in bone marrow.
2) *Acute leukaemia:*
   Hepatosplenomegaly & infiltration of bone marrow by blast cells.
3) *Other causes of thrombocytopenia (discuss).*

For more details:

	ITP	*Aplastic anemia*	*Leukemia*
History:	Fever 2 weeks before onset of purpura.	- History of exposure to bone marrow depressant drugs or viral infection. - The cause maybe idiopathic. - Fever (infections). - Repeated blood transfusion.	- Prolonged fever. - Arthralgia or arthritis. - Recent significant weight loss.
Examination:	- Good general condition. - No anemia except in severe blood loss. - No organomegaly.	- Bad general condition. - Marked pallor. - No organomegaly.	- Bad general condition. - Pallor. -Hepatosplenomegaly & lymphadenopathy.
Investigations:	Blood picture: Thrombocytopenia.	Pancytopenia.	Thrombocytopenia, anemia. WBCs: normal, increased or

			decreased.
	Anti-platelet antibodies (+ve in 60%).		
	Bone marrow examination: normal or increased megakaryocytes with defective budding.	Bone marrow aplasia.	Infiltration by blast cells.

➔ *Investigations:*

1) *Blood picture:*
   - **Thrombocytopenia** (usually <20.000) *normal: 150.000-400.000/mm^3.*
   - Anemia **(low Hb)**, if severe blood loss.
   - Normal white blood cell count with relative lymphocytosis.
2) *Anti-platelet antibodies:*
   - In 60% of cases.
3) *Bone marrow aspirate:*
   - Normal or increased megakaryocytes with defective budding (very few platelets along their margins).
   - Normal granulocytic & erythroid series.

➔ *Treatment:*

1) *Mild cases (cutaneous hemorrhage only, 85% of cases):*
   - No treatment.
   - Just observation & follow up (CBC every day) + avoid trauma & salicylates.
2) *Moderate cases (persistent muco-cutaneous hemorrhage):*
   a) *Steroids (Prednisone):*
      - **Action**: inhibit antibody synthesis & phagocytic activity.
      - **Dose:** 2 mg/kg/day.
      - **Duration**: 2 weeks.
   b) *IV immunoglobulin "IVIG" or anti D:*
      - **Action**: Bind to antibodies before attacking platelets & block phagocytic activity.
      - **Dose:** 1 gm/kg/day.
      - **Duration:** 2 days.
      - Excellent response: rapid rise in platelets.
3) *Severe cases (severe muco-cutaneous hemorrhage or intracranial hemorrhage):*
   - Steroids: IV methyl prednisolone 20 mg/kg/day for 5 days.
   - IV immunoglobulin.
   - Transfusion therapy:
     Platelet transfusion.
     In case of severe bleeding, fresh whole blood maybe needed.
   - Plasmapharesis (transient effect): in cases refractory to all other forms of treatment.
   - Emergency splenectomy: if no response to other measures (final solution).
4) *Chronic cases (more than 12 months):*
   - Careful evaluation of associated disorders (as in SLE: frequent screening of

autoantibodies).

- Trial of other measures (steroids, immunoglobulin).
- Splenectomy: in severe chronic cases not responding to other measures (75% curative).
- Immunosuppressive: as Azathioprine or Cyclosporine.

➔ *Prognosis:*

- Acute serious hemorrhage as intracranial hemorrhage occurs in the acute phase (1st 1-2 weeks).
- 75% of cases recover completely within < 3 months (good prognosis).

---

10. Henoch-Schonlein purpura.

➔ *Definition:*

Systemic immune vasculitis *(inflammation of blood vessels)* with non-thrombocytopenic purpura due to circulating IgA, involving vasculitis in skin, joints, kidney & GIT (normal platelet count).

➔ *Etiology:*

- Unknown.
- Usually preceded 2 weeks ago by upper respiratory tract viral infection "fever" (more in winter).
- More in boys.

➔ *Clinical picture:*

1) Purpuric symmetrical **palpable** rash (100% of cases): over **buttocks**, **lower limbs**, less over upper limbs (trunk is usually spared).
2) Joint involvement (2/3 of cases): transient pain & swelling esp. in knees & ankles.
3) GIT involvement (50% of cases): colicky abdominal pain & bleeding.
4) Renal involvement (1/3 of cases): nephritis (hematuria).
5) Testicular involvement (5% of cases): hemorrhage & swelling.
6) Intracranial hemorrhage (5% of cases).

➔ *Investigations:*

- Diagnosis is mainly clinical.
- If in doubt:
  1) Laboratory:
     - Complete blood picture: normal platelet count.
     - Bleeding profile should be done (as in hemophilia).
     - ESR & CRP: elevated (inflammation).
     - Urine analysis: screen for hematuria.
     - Stool analysis: screen for blood in stool.
     - Renal function (urea & creatinine) & complement (C3): screen for nephritis.
  2) Imaging:
     - X-ray & abdominal ultrasound if any doubt regarding gut perforation or intussusception.

➔ *Treatment:*

1) Pharmacological:

- **Salicylates** or non-steroidal anti-inflammatory drugs in most cases.
- **Steroids** in case of GIT bleeding, nephritis or intracranial hemorrhage.

2) Supportive.

3) Monitoring of abdominal & renal complications.

➔ *Prognosis:*

Recovery within several days to few weeks in most cases.

---

11. Describe clinical features of a case of hemophilia A.

Discuss etiology, clinical picture, laboratory investigations & treatment of different types of hemophilia.

Give full account of hemophilia A.

Hemophilia A (classic hemophilia)

➔ *Genetics:*

X-linked recessive disease with reduced factor VIII conc. (more in males).

➔ *Incidence:*

1\14000 male – 80% of cases of haemophilia.

➔ *Clinical features:*

1. Bleeding in neonatal period:

   Circumcision bleeding, prolonged bleeding from heel stick or venepuncture from umbilical stump.
2. Extensive bruising, hematoma, and bleeding from minor trauma on ambulation.
3. Hemoarthrosis:
   - Hallmark of hemophilia.
   - With trauma or spontaneous.
   - If repeated → degenerative joint changes (ankylosis) with unstable fixed joint.
4. Spontanous bleeding from orifices:

   Epistaxis or hematuria in severe cases.
5. Internal organs:
   - Intramuscular hemorrhage (e.g. psoas hemorrhage).
   - Intracranial haemorrhage.

➔ *Complications:*

1. Intracranial hemorrhage.
2. Psoas hemorrhage may be fatal.
3. Ankylosis.
4. Complications of treatment:
   a. Blood borne infections (HIV-HBV-HCV-CMV).
   b. Development of antibodies against transfused factor VIII (5-20%).
      - This results in resistance to treatment.
      - Require higher dose of plasma or bypassing agent (active factor VII).
   c. Complications of vascular access:
      - Thrombosis – infections – difficult cannulation.

➔ *Investigations:*

1. PTT: prolonged (phase I coagulation defect).
2. Specific factor VIII assay: reduced below normal.
   - Normal > 60%

- Carrier 30-60% (female)
- Mild hemophilia 5-30% (bleeding with trauma or surgery).
- Moderate hemophilia 1-5% (bleeding with minor trauma).
- Severe hemophilia < 1% (spontaneous joint bleeding).

➔ *Treatment:*

A. Prevention:

1. Avoid trauma.
2. Avoid Aspirin
3. Physiotherapy to prevent ankylosis.
4. Give HBV vaccine.

B. Actual treatment:

1. Cold compresses to minimize bleeding in mild cases.
2. <u>Replacement (essential in severe cases):</u>
   a. IV infusion of cryoprecipitate (plasma concentrate of factor VIII): Dose: 25-50 unit/kg every 12 hours.
   b. IV infusion of purified factor VIII concentrate.
   c. Recombinant factor VIII.
   d. Prophylactic factor VIII in severe hemophilia (2 times/week).
3. Desmopressin in mild hemophilia A:
   - Increases endogenous release of factor VIII (ineffective in hemophilia B).
4. Physiotherapy, especially after immobilization to prevent muscle wasting & joint contracture.

➔ *DD of hemophilia in general:*

1. Acquired coagulation defects as liver failure: clinical & laboratory evidence of LCF.
2. Disseminated intravascular coagulation (DIC): critically-ill patient, fibrin degradation products (FDPs) in blood.

Hemophilia B (Christmas disease)

➔ *Etiology:*

X-linked recessive – 15% of all hemophilia due to factor IX deficiency.

➔ *C/P:*

As hemophilia A but delayed onset & milder bleeding.

➔ *Investigations:*

- Prolonged PTT.
- Reduced factor IX.

➔ *Treatment:*

Fresh frozen plasma or factor IX concentrate (once or every 24 hours).

Hemophilia C

- Autosomal recessive.
- Deficient factor XI.
- Rare (5%).

---

12. Discuss the differential diagnosis for children with anemia and splenomegaly.

1. Thalassemia.

2. Sickle cell anemia.
3. Hereditary spherocytosis.
4. Chronic autoimmune hemolytic anemia.
5. Iron deficiency anemia (splenomegaly in 15% of cases).
6. Malaria.
7. Sepsis.
8. Leukemia.
9. Gaucher disease.

   Discuss diseases as before.

OTHER TOPICS:

1. Causes of anemia.

➔ *Definition:*

Decrease of hemoglobin or hematocrit concentration below normal value for age.

➔ *Range:*

- At birth: 15-20 gm/dl.
- 2-3 months: decrease to 10 gm/dl (physiologic anemia).
- Rise gradually with age to 15 gm/dl at 15 years.

➔ *Causes:*

i. *Decreased RBCs production:*

A. *Dyshemopoietic anemia:*

- Iron deficiency anemia (most common cause).
- Folic acid and vitamin B_{12} deficiency (megaloblastic anemia).
- Vitamin C and protein deficiency.
- Cu and vitamin B_6 deficiency.
- Chronic renal failure.

B. *Anemia of bone marrow origin:*

1. *Bone marrow depression (decreased reticulocytes):*

a. Pure red cell aplasia:

- Hereditary: Shwachman-Diamond syndrome (autosomal recessive, associated with exocrine pancreatic failure).
- Acquired: Parvo virus B19.

b. Aplastic anemia (pancytopenia):

- Hereditary: Fanconi anemia.
- Acquired: idiopathic, 2ry to infections (hepatitis B), toxins (insecticides), irradiation.

2. *Bone marrow infiltration by abnormal cells:*

a. Malignant cells as in leukemia.

b. Metabolic cells as in Gaucher disease.

ii. *Increased RBCs loss:*

A. *Hemolysis:*

Acute or chronic, with increased reticulocytes.

1. *Hereditary (corpuscular defect):*

All chronic except G6PD deficiency.

a. Membrane defect:

- Hereditary spherocytosis.
- Hereditary elliptocytosis.

b. Enzyme defect:

- G6PD deficiency.
- Pyruvate kinase deficiency.

c. Hemoglobin defect:

- Thalassemia (quantitative).
- Sickle cell anemia (qualitative).

2. *Acquired (extra-corpuscular or extrinsic):*
   <u>All acute except chronic autoimmune hemolytic anemia.</u>
   a. <u>Immunologic disorders (+ve Coomb):</u>
      - Rh & ABO incompatibility.
      - <u>Autoimmune hemolytic anemia:</u>
        – Idiopathic.
        – Infections (as EBV, CMV & mycoplasma pneumonia).
        – Drug-induced (as methyldopa, penicillin).
        – Collagen vascular diseases (as SLE).

   b. <u>Non-immunologic disorders:</u>
      - Sepsis.
      - Malaria.
      - Wilson disease.
      - Artificial valve.
      - DIC.
      - Hemolytic uremic syndrome.

B. Hypersplenism:
Leads to pancytopenia with reticulocytosis.

C. Hemorrhagic anemia (blood loss):
1. <u>Acute:</u>
   - Trauma.
   - Accidents.
   - Surgery.
   - Varices.
   - Circumcision in hemophilics.
2. <u>Chronic:</u>
   - Feto-maternal transfusion.
   - Ankylostoma & bilharziasis.
   - Meckel's diverticulum.
   - Cow milk allergy.

➔ *General clinical picture of anemia:*
Pallor, dyspnea, easy fatigue, tachycardia & murmurs.

---

2. Factors affecting erythropoiesis.

1. Hypoxia:
Stimulate the liver (intrauterine), or kidney (later) to secrete erythropoietin which stimulates erythropoiesis.

2. Endocrinal factors:
a. Sex hormones.
b. Thyroid hormones.
c. Adrenal hormones.

3. *Nutritional factors:*
    a. Minerals: iron.
    b. Vitamins: B_{12}, folic acid, B_6, C, and E.
    c. Amino-acids.
    d. Trace elements: copper and cobalt.
4. *Hematopoietic growth factors.*

---

3. Hereditary spherocytosis.

➔ *Definition:*
- Autosomal dominant form of chronic hemolytic anemia (25% new mutation).
- More common in Europe.

➔ *Pathogenesis:*

Defect in Spectrin or Ankyrin of RBC membrane → increased Na^+ permeability → increased water influx → RBCs become spherical and less deformable → premature destruction in the spleen.

➔ *Clinical picture:*
1. Onset: may present with neonatal jaundice and anemia.
2. May present later in infancy or childhood.
3. Less incidence of complications and less severe course.

➔ *Investigations:*
1. Blood smear: spherocytes.
2. Osmotic fragility test: increased.
3. Cryohemolysis: increased.

➔ *Treatment:*
1. Blood transfusion and chelation (less frequent).
2. Cholecystectomy in case of gall bladder stones.
3. Splenectomy is very beneficial and considered curative (only in severe cases).

---

4. Von-Willebrand disease (vascular hemophilia).

➔ *Genetics:*

Autosomal dominant defect in production of VW protein.

➔ *Pathogenesis:*

<u>Von-Willebrand protein plays 2 roles:</u>
- Facilitates platelet adhesion.
- Protects factor VIII from breakdown (acts as carrier protein).

If VW factor is reduced → reduced factor VIII activity and defective platelet adhesion.

➔ *Clinical features:*
1. Mild bleeding tendency; mainly epistaxis, bleeding gums, bruising, menorrhagia and bleeding with surgery.
2. Spontaneous hemorrhage is extremely rare.

➔ *Investigations:*
1. Normal platelet count but defective platelet adhesion (prolonged bleeding time).
2. Prolonged PTT.

3. Reduced level of VW protein & factor 8.

➔ *Treatment:*

1. IV infusion of fresh frozen plasma, cryoprecipitate (factor 8) or vW factor.
2. Desmopressin can help in mild cases.

---

5. Anemia with malnutrition.

➔ *Etiology:*

1. Usually in kwashiorkor.
2. Protein deficiency, folic acid, B_{12}, iron deficiency.
3. Red cell hypoplasia in bone marrow.
4. Shortened RBC life span.
5. Associated infections.

➔ *Clinical picture & investigations:*

For anemia & malnutrition (discuss C/P of rickets, marasmus & kwashiorkor).

➔ *Treatment:*

1. Replace deficiencies (mainly iron).
2. Treatment of parasitic infections and malnutrition.

---

6. Ankylostoma anemia.

➔ *Etiology:*

Heavy infestation may lose up to 250 ml. of blood daily in GIT leading to iron deficiency anemia and hypoproteinemia.

➔ *Clinical picture:*

1. C/P of iron deficiency anemia (discuss).
2. Edema and signs of malnutrition.
3. Heart failure in severe cases.

➔ *Treatment:*

1. Treatment of iron deficiency anemia.
2. Albendazole and Flubendazole 100 mg orally twice daily for 3 days.

IMPORTANT NOTES:

1. Yolk sac → site of blood cell formation (1st 2months) intrauterine.
2. Liver → site of blood cell formation (2-7 months) intrauterine.
3. Bone marrow → site of blood cell formation after birth.
4. Schwachman- diamond syndrome → Inherited cause of pure red cell aplasia
5. Most common cause of anemia in infancy → iron deficiency anemia.
6. Hair on end sign → x-ray of chronic hemolytic anemia.
7. Cooley's anemia → B- thalassemia major.
8. Hand- foot syndrome→1st presentation of sickle cell anemia as part of vaso-occlusive crisis.
9. Commonest chronic hemolytic anemia in Egypt → thalassemia.
10. Heinz bodies → precipitated methemoglobin specific for G6PD def.
11. Most common cause of congenital aplastic anemia → Fanconi.
12. Most common cause of acquired aplastic anemia → idiopathic.
13. Most common forms of childhood malignancies → acute leukemia.
14. Hallmark of hemophilia → hemarthrosis.
15. Increased megakaryocyte with defective budding → bone marrow picture of ITP.
16. Most common RBCs enzymopathy → G6PD deficiency.

Respiration

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **Define acute bronchitis, mention the causative organisms, clinical picture and its management.**

➔ *Definition:*

Acute lower respiratory tract infection with inflammation of the bronchi (large and medium-sized airways) of the lungs.

➔ *Incidence:*

The **most common cause** of **acute cough** in children.

➔ *Causative organisms:*

1. Non-specific bronchitis:
   - Mostly viral after upper respiratory tract infection (adenovirus, parainfluenza virus).
   - Bacterial infections (pneumococci, streptococci, staph, hemophilus influenza) → occur in early infancy, with malnutrition and immunodeficiency.
2. Specific bronchitis:
   - Measles, pertussis, diphtheria & scarlet fever.

➔ *Clinical picture:*

1. *Before the onset:*

   Naso-pharyngitis:
   - Low grade fever (subsides in 2 days).
   - Nasal discharge: watery then mucoid (subsides in 1 day).
   - Nasal block: interferes with feeding.
   - Pharyngeal examination: congestion.
2. *Onset:*
   - Gradual with dry cough.
3. *Course of illness (3 stages, each for few days):*
   a. Early stage:
      - Symptoms: Severe dry cough: metallic (brassy) and maybe spasmodic (tracheitis).
      - Signs: None (diagnosis depends entirely on characters of cough).

   b. Productive stage:
      - Symptoms:
        - Less severe, productive cough.
        - The chest becomes rattling.
      - Signs: Chest examination → palpable rhonchi, expiratory rhonchi and moist crepitations.

   c. Convalescent stage:
      - Symptoms: Cough decreases in frequency and severity.
      - Signs: Disappear gradually.

N.B.

- It is not unusual for simple bronchitis to remain as long as 2 weeks.

- Bacterial infection is suspected when there is:
  1. High fever.
  2. Purulent sputum.
  3. Prolonged illness.

➔ *Differential diagnosis (other causes of cough):*

Discussed later.

➔ *Treatment:*

1. **Most cases resolve spontaneously.**
2. **Expectorants and mucolytics:**
   - Warm liquids and good hydration are the best expectorant.
   - Cough suppressants only in very severe cough.
3. **Anti-histaminics and anti-pyretics.**
4. **Antibiotics** (if bacterial infection is suspected → high fever, purulent sputum or prolonged illness):

   Oral amoxicillin 50 mg/kg/day for 7 days.

---

2. Mention diagnosis and complications of pneumonia.

Enumerate causes and complications of pneumonia.

➔ *Definition:*

Common serious lower respiratory tract infection with acute inflammatory consolidation of lung parenchyma (alveoli and/or interstitial tissue infiltration).

➔ *Etiology:*

1. *Infectious:*
   - *A. Bacterial:*
     - Gram +ve:
       - Pneumococci (**most common bacteria below 6 years**).
       - Streptococci.
       - Staphylococci.
     - Gram –ve:
       - Klebsiella.
       - Hemophilus Influenzae.
       - Pseudomonas.
     - Others:
       - Mycoplasma (**most common bacteria above 6 years**).
       - Mycobacterium tuberculosis.
   - *B. Parasitic:*
     - Loeffler's pneumonia.
     - Pneumocystis carinii.
   - *C. Viral:*
     - Respiratory syncytial virus (**most common at all**).
     - Adenovirus.
   - *D. Fungal:*
     - Aspergillosis.

2. *Non-infectious:*

A. **Aspiration** & chemical pneumonia (vomitus, amniotic fluid, kerosene and foreign body).

B. **Hypostatic** pneumonia.

➔ *Pathological types:*

1. *Lobar pneumonia:*
   - **Unilateral** involvement of one or more lobes.
   - Mostly **bacterial.**
     Other causes: mycoplasma pneumonia and tuberculosis.
   - Chest x-ray → lobar consolidation.
2. *Broncho-pneumonia:*
   - **Bilateral** involvement of both lungs with small foci.
   - Maybe **bacterial or viral.**
   - Chest x-ray → fine nodular or patchy infiltration.
3. *Interstitial pneumonia:*
   - **Bilateral** involvement of interstitial tissues.
   - Mostly **viral.**
   - Chest x-ray → dense para-hilar shadow with radiating streaks.

➔ *Clinical picture:*

A. Symptoms:

Pneumonia is suspected in every case of:

1. Respiratory distress.
2. Fever.
3. Cough.
4. Difficult feeding and referred pain (neck or abdomen).

B. Signs:

1. *Signs of respiratory distress:*
   - Grade I: tachypnea (rapid respiration and working alae nasi).
   - Grade II: intercostal and subcostal retractions.
   - Grade III: expiratory grunting.
   - Grade IV: cyanosis and respiratory failure.
2. *Signs according to pathological type:*
   - Lobar pneumonia: bronchial breathing and dullness on percussion on affected lobe.
   - Bronchopneumonia: fine bilateral consonating crepitations.
   - Interstitial: spasmodic cough and wheezes.
3. *Diagnosis of causative organism:*
   a. *Bacterial pneumonia:*
      - **High grade** fever.
      - **Elevated** ESR, CRP + **leukocytosis.**
      - Chest x-ray: lobar pneumonia.
   b. *Viral pneumonia:*
      - **Low grade** fever.
      - **Mild or no elevation** in ESR & CRP.

- Chest x-ray: interstitial pneumonia.

➔ *Investigations:*

1. *Chest x-ray:*
   a. Confirm the diagnosis:
      - Lobar pneumonia → lobar consolidation.
      - Bronchopneumonia → fine nodular or patchy infiltration.
      - Interstitial pneumonia → dense para-hilar shadow with radiating streaks.
   b. Detect complications:
      - Effusion, empyema, pneumatocele, lung abscess, ..
2. *Blood gases:*

In severe cases → low O_2 tension and raised CO_2.

3. *Complete blood count, ESR & CRP:*

To differentiate between bacterial (elevated) and viral causes (mild or no elevation).

4. *Culture and sensitivity:*

Morning nasopharyngeal aspirate or sputum culture.

➔ *Complications:*

1. **Pleural effusion:** With bacterial pneumonia, esp. staph.
2. **Lung abscess**: With bacterial pneumonia esp. staph.
3. **Pneumato**cele.
4. **Pneumo**thorax.
5. Respiratory **failure**: Most serious and common cause of death.
6. Myocarditis and acute heart **failure**: In small infants with bacterial pneumonia.

➔ *Treatment:*

1. *Hospital management:*
   ➢ Indications:
      – Severe pneumonia (severe respiratory distress).
      – Complicated pneumonia.
      – Small infants (less than 6 months).
   a. Support:
      – Humidified oxygen.
      – IV fluids (nothing per oral).
      – Suction.
      – Mechanical ventilation in respiratory failure.
   b. Specific treatment:

      Broad spectrum combined parenteral antibiotics (cover gram +ve and gram –ve):
      – Ampicillin 50-100 mg/kg/day + Gentamycin 4-6 mg/kg/day.
      – For 7-10 days.
      – Maybe changed according to results of culture and sensitivity test and clinical response.
   c. Treatment of complications:

      Drainage of empyema, mechanical ventilation in respiratory failure, ..

2. *Home management for most cases:*
   - ➢ Indications:

     Older children with mild pneumonia and no distress.
   - ➢ Specific treatment:
     - – Oral or better intramuscular antibiotics.
     - – Amoxicillin 50 mg/kg/day or better broader-spectrum antibiotics as amoxicillin-clavulanic acid.

---

3. Define bronchiectasis, mention its causes, pathologic changes, clinical manifestations, investigations and treatment.

➔ *Definition:*

Permanent dilation of (medium-sized) bronchi with inflammatory destruction of their walls and accumulation of pus, mainly in dependent bronchi.

➔ *Etiology:*

A. Congenital:

Maldevelopment of bronchi (rare).

B. Acquired:

Chronic chest infection, due to:

1. Foreign body.
2. TB.
3. Lung abscess.
4. Immotile cilia syndrome.
5. Cystic fibrosis.
6. Gastro-esophageal reflux disease.

➔ *Pathological changes:*

- Destruction of ciliated epithelium → damage of elastic tissue.
- Thickening of the wall by edema and fibrosis.
- Distortion of bronchial wall into spherical, cylindrical or fusiform shapes (dilated).
- More stagnant pus in the dependent bronchi.

➔ *Clinical picture:*

A. Symptoms:

1. General manifestations of toxemia:
   a. Fever.
   b. Clubbing.
   c. Anorexia and weight loss.
2. Respiratory manifestations:
   a. Cough with foul-smelling purulent copious sputum with postural variation.
   b. Maybe hemoptysis.

B. Signs:

1. Patchy bronchial breathing.
2. Coarse crepitations over the affected parts.

➔ *Complications:*

1. Respiratory failure.
2. Failure to thrive.

➔ *Investigations:*

1. Chest x-ray:
   Honeycomb or soap-bubble appearance.
2. CT chest:
   Confirm diagnosis.

➔ *Treatment:*

1. Systemic broad-spectrum antibiotics (4-6 weeks).
2. Postural drainage and chest physiotherapy.
3. Bronchodilators and symptomatic treatment.
4. Surgical resection for localized bronchiectasis.

---

4. Causes, clinical picture, investigations and treatment of empyema (purulent pleurisy).

➔ *Definition:*

Pus in pleural cavity.

➔ *Etiology:*

1. Secondary to pneumonia:
   - Pneumococci.
   - Staphylococci.
   - Hemophilus influenzae.
2. Rupture of lung abscess.
3. Chest trauma or surgery.
4. Mediastinitis.
5. Sub-diaphragmatic abscess.

➔ *Clinical picture:*

A. Symptoms:

1. General constitutional symptoms:
   - High **F**ever.
   - **A**norexia.
   - **H**eadache.
   - **M**alaise.
2. Respiratory manifestations:
   - Difficult breathing.
   - Chest pain:
     - Exaggerated with cough and deep breathing.
     - Decreased when the child lies on the affected side.

B. Signs:

1. Inspection: Diminished movement on affected side.
2. Percussion: Dullness.
3. Auscultation: Diminished breath sounds.

➔ *Complications:*

1. Broncho-pleural fistula.
2. Chronicity: Pleural fibrosis with limited chest expansion.

➔ *Investigations:*

1. Chest x-ray: Unilateral or bilateral massive homogenous opacity obliterating costo-phrenic angle.
2. Thoracocentesis: With culture of drained material.

➔ *Treatment:*

1. Systemic broad-spectrum antibiotics (4-6 weeks).
   "Antibiotics are modified according to culture and sensitivity".
2. Closed drainage of pus by underwater seal.
3. Chronic cases:
   Surgical decortication.

---

5. Discuss diagnostic work-up (investigations) of tuberculosis in children.
Indications of corticosteroids in tuberculosis.
Describe lab and radiological investigations of pulmonary TB.

Pulmonary tuberculosis

➔ *Causative organism:*

- Mycobacterium tuberculosis (**the main cause**).
- Others: mycobacterium bovis and mycobacterium africanum.

➔ *Mode of infection:*

By inhalation and ingestion.

➔ *Sites of primary infection:*

- Lung: commonest site (98%).
- Other sites: skin, tonsils & intestine.

➔ *Primary pulmonary complex consists of:*

1. Primary focus:
   Small caseous focus (1-2 cm) in lung parenchyma due to union of multiple tubercles (Ghon's focus).
2. Lymphangitis.
3. Regional lymphadenitis.

➔ *Fate of primary complex:*

1. Healing by fibrosis and calcification in **most cases**.
2. Spread of infection (post-primary TB):
   - Local spread → TB pneumonia and TB pleurisy.
   - Bronchial spread → bronchopneumonia or lung collapse.
   - Blood spread → miliary TB or distant spread (e.g. TB meningitis).

➔ *Clinical picture:*

A. Symptoms:

1. Manifestations of TB toxemia:
   Night fever, night sweats, loss of appetite & loss of weight.
2. Respiratory manifestations:
   - Chronic cough is the main symptom.
   - Purulent, mucoid or bloody sputum.
   - Localized wheezes.

- History of false diagnosis as pneumonia for long period.

B. Signs:

Vary according to the pathological lesion:

- **Pneumonic lesions** → signs of consolidation (dullness on percussion, crepitations and bronchial breathing).
- **Pleural effusion** → signs of effusion (diminished air entry and dullness).
- **Fibrosis** → deviation of trachea and mediastinum to the same side.
- **Compression** of trachea and bronchi by tuberculous LNs → wheezes.

➔ *Investigations:*

1. *Tuberculin test (Mantoux test):*

The most important immunological diagnostic tool.

➢ Nature and administration:

- 0.1 ml (10 units) of purified protein derivative (PPD).
- Intradermal injection into skin of flexor surface of forearm.

➢ Response (delayed hypersensitivity reaction):

- Assess local reaction at **48-72 hours.**
- Measure the **induration** not redness (longitudinal & transverse and get the average):
  - < 5 mm → negative reaction (not exposed to TB before).
  - 5-9 mm → doubtful (repeat with higher dose).
  - > 10 mm → positive reaction (BCG vaccination or infection "if not vaccinated").
  - > 15 mm → infection (vaccine response never exceeds 15 mm in diameter).

➢ *False negative tuberculin test occurs in:*

a. Early **disease** (before immunological response).
b. Advanced **disease** (military TB).
c. Poor tuberculin.
d. Faulty technique (SC injection).
e. **C**orticosteroid administration.
f. **C**hronic debilitating disease, cachexia and immunodeficiency.
g. Recent anti**viral** vaccine (esp. measles and mumps).
h. Intercurrent **viral** infection.

➢ *False positive tuberculin test occurs in:*

a. BCG vaccination.
b. Infection with atypical mycobacteria (leprosy).

2. *Chest x-ray and CT chest:*

- X-ray shows: mediastinal LNs, military shadows and persistent shadows.
- Used in mass screening for TB.

3. *Isolation and culture of organism:*

- Get sputum through gastric aspirate.
- Direct smear with ZN stain.
- Culture on:
  - Lowenstein-Jensen medium (4 weeks).
  - BACTEC culture (only 10 days).

4. *Quantiferon TB test:*

Good negative test.

5. *ELISA.*
6. *PCR:*

   Detect TB DNA.

7. *Lymph node biopsy:*

   For undiagnosed cases.

8. *CBC:*

   Lymphocytosis.

9. *ESR:*

   Very high (usually above 100).

➔ *Prevention of tuberculosis:*

1. *General measures:*
   - Good nutrition, housing and better aeration.
   - Elimination of TB in cattle.
   - Pasteurization of milk.
   - Mass radiography to detect diseased persons and treat them early.
   - Repeated examination and radiography of employees who deal with children in hospitals, schools and nurseries.
2. *BCG vaccination:*

   Discuss as in vaccination chapter.

3. *Chemoprophylaxis:*

   Isoniazid 15 mg/kg/day for 6 months to 1 year in children with prolonged contact with open cases.

➔ *Treatment (chemotherapy) of tuberculosis:*

A. *Anti-tuberculous drugs:*

1. 1st line drugs:
   a. Isoniazid (INH):
      10-15 mg/kg/day oral.
   b. Rifampicin (Rifampin, RIF):
      10-20 mg/kg/day oral.
   c. Pyrazinamide (PZA):
      20-40 g/kg/day oral.
2. Alternative drugs:
   a. Streptomycin (STM), 20-40 mg/kg/day **IM**.
   b. Ethambutol (ETB), 15-20 mg/kg/day oral.
   c. Ethionamide (ETH), 15-20 mg/kg/day oral.
3. Other drugs:
   a. Kanamycin.
   b. Amikacin.
   c. Para-amino salicylic acid.

➢ *Regimen of treatment:*

6-9 months treatment:

- 2 months by INH + rifampicin + pyrazinamide.
- Followed by 4 months of INH + rifampicin.

N.B.

TB meningitis and pyelonephritis need longer course of anti TB medications.

B. Indications of steroids in TB:

1. **E**xudative forms:
   Pleurisy, pericarditis and ascites.
2. **E**ndobronchial TB.
3. **A**llergy to anti-tuberculous drugs.
4. **A**fter removal of cervical LNs to avoid fistula.
5. TB **M**eningitis → steroids for 1 month to reduce complications.
6. **M**iliary tuberculosis.

---

6. Describe mechanism of airway obstruction during asthmatic attacks.
Clinical grading of acute asthma.

➔ *Definition:*

- Chronic inflammation with diffuse obstructive lung disease, characterized by:
  - Hypersensitivity to variety of stimuli.
  - High degree of reversibility.
- It is the commonest cause of wheezing in children.

➔ *Incidence:*

- 10% of school age children.
- Male to female (2:1) till puberty, then equal.

➔ *Onset:*

- 30% in the 1st year.
- 90% by the age of 5 years.

➔ *Inheritance:*

Multifactorial.

➔ *Prognosis:*

- Mild asthma: 50% remission.
- Severe asthma (steroid dependent): 95% persistence.

➔ *Pathophysiology (mechanism):*

1. Exposure to triggers:

Allergens:

- Pollens.
- Pets.
- Mold.
- Food.

Others:

- RSV.
- **C**old air.
- **D**rugs
- **E**motional excitement.

- Smoke.

2. *Mast cell degranulation & release of chemical mediators, which are:*
   - Preformed: histamine and neutrophil chemotactic factor.
   - Newly-formed: prostaglandins and leukotrienes.
   - Cytokines from other inflammatory cells (lymphocytes & eosinophils).
3. *Airway changes:*
   - Bronchospasm.
   - Hyper-secretion.
   - Edema & cellular infiltration of submucosa.
4. *Airway obstruction (more with expiration):*

Leading to hyperinflation or atelectasis (ventilation/perfusion mismatch).

5. *Structural airway changes in long-standing severe cases.*

➔ *Clinical picture:*

1. *History:*
   - Recurrent attacks of **cough**, **wheezes & respiratory distress**:
     - Mainly at night and early morning.
     - Precipitated by triggers and relieved with bronchodilators.
   - **History** of other atopy (e.g. eczema or atopic rhinitis).
   - Family **history** of atopy.
2. *Examination:*

A. Severity of attack:

	Mild	**Moderate**	**Severe**
Inspection	No distress.	Respiratory distress grade I or II.	Respiratory distress grade III or IV.
Auscultation	Prolonged expiration with mild expiratory wheezes.	Marked expiratory wheezes.	Diminished air entry with minimal or no wheezes.
Treatment	At home.	In emergency room.	In ICU.

B. Types of asthma:

	Intermittent	**Persistent**	**Seasonal**
Day symptoms	< 1/week.	Frequent.	All symptoms are related to a special season: - Allergy to pollens in April and June. - Allergy to mites in August and September.
Night symptoms	≤ 2/month.	Frequent.	
Between attacks	Free.	Not free (symptomatic).	

C. GINA classification before treatment:

	Intermittent	**Mild persistent**	**Moderate persistent**	**Severe persistent**
Day symptoms	< 1/week.	> 1/week.	Daily.	Continuous symptoms.
Night symptoms	≤ 2/month.	< 2/month.	Once/week.	Frequent.
Affecting activity or sleep	Not affected.	May affect.	Affect.	Marked.
PEFR or FEV_1% of predicted	> 80%.	> 80%.	60-80%.	< 60%.
PEFR or FEV_1 variability	< 20%.	20-30%.	> 30%.	> 30%.

N.B.

- PEFR = Peak Expiratory Flow Rate.
- FEV_1 = Forced expiratory volume (in 1st second).

D. GINA classification within 4 weeks of treatment:

	Controlled (all the following)	**Partly controlled (any of the following)**	**Uncontrolled**
Day symptoms	None to twice/week.	> 2/week.	3 or more features of partly controlled asthma.
Need reliever	None to twice/week.	> 2/week.	
Affect activity	No.	Any.	
Exacerbation	No.	Any (1 or more/year).	
Lung function	Normal.	< 80% of predicted PEFR or FEV_1.	

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7. Discuss drugs used in treatment of bronchial asthma.

Discuss treatment of acute attacks of bronchial asthma. Mention the anti-asthma controller medications with their routes of administration.

Describe management of acute severe asthma.

Discuss bronchodilator therapy in childhood asthma.

Management = Diagnosis + Treatment.

➔ *Diagnosis:*

1. *Clinical diagnosis:*
   See before.
2. *Investigations:*
   A. Blood picture:
      Eosinophilia.
   B. IgE (total and specific):
      Increased.
   C. Allergy skin tests (skin prick test):
      Using common antigen to detect the cause.

D. Bronchial challenge test and exercise challenge test.

E. ABG and O_2 saturation in severe cases.

F. X-ray chest:

- Hyperinflation.
- Indications: suspected pneumothorax, collapse or chest infection.

G. Pulmonary function tests (spirometry):

Peak expiratory flow rate (PEFR) & forced expiratory volume in the 1st second (FEV_1):

- Reduced.
- Marked variability indicates poor control.

DD of asthma (see later).

➔ *Treatment:*

1. Treatment of acute attacks (asthma relievers).
2. Preventive treatment (asthma controllers).
3. Avoidance of triggering stimuli.
4. Patient and family education.

A. Treatment of acute attacks (asthma relievers):

➢ Drugs used:

Drug	*Dose*	*Route*
Short acting beta 2 agonist (SABA): as salbutamol or terbutaline.	0.15-0.3 mg/kg/D.	Oral or inhalation.
Anticholinergic drugs: as ipratropium.	250 microgram/dose.	Inhalation (4 times/day).
Methyl-xanthine derivatives: as theophylline.	15-20 mg/kg/day.	Oral, rectal or IV.
Anti-inflammatory (steroids): Prednisone or Hydrocortisone.	1-2 mg/kg/day. 6 mg/kg/6 hours.	Oral. IV.

➢ Protocol of treatment:

1. Mild:
   - 1 or 2 drugs of the bronchodilators.
   - Best is inhalation by inhaler or nebulizer.
2. Moderate:
   Add oral steroids.
3. Severe (status asthmaticus):
   - Admission to ICU with monitoring.
   - Oxygen and intravenous fluids.
   - Salbutamol 0.25-0.5 ml/3 ml saline every 1-2 hours by nebulizer.
   - IV aminophylline (slow infusion) 5 mg/kg/6 hr.
   - IV hydrocortisone 5-10 mg/kg/6 hr.
   - Magnesium sulfate (parenteral).
   - Mechanical ventilation, if:
     - Respiratory failure ($PaCO_2$ > 55 mmHg, severe hypoxia, severe acidosis).
     - Disturbed consciousness.

B. Prophylactic treatment (asthma controllers):

➢ Drugs used:

Drug	*Route*
Inhaled corticosteroids.	Inhalation. Beclomethasone divided into 4 doses. Budesonide or Fluticasone divided into 2 doses.
Oral corticosteroids (prednisone).	Oral, short course for 3-10 days.
Long acting beta 2 agonists (LABA): fenoterol or salmeterol.	Inhalation.
Mast cell stabilizers: sodium chromoglycate (intal).	Inhalation (3-4 doses per day).
Leukotriene modifiers: Montelukast.	Oral.
Immunosuppressive therapy.	

➢ Protocol of treatment (stepwise approach):

1. Step 1 (intermittent asthma):
   No daily medication (only relievers are enough).
2. Step 2 (mild persistent):
   - Low dose of inhaled corticosteroids *(LDIC)* by metered dose inhaler or dry powder inhaler.
   - Alternative: anti-leukotriene.
3. Step 3 (moderate persistent):
   - Low dose inhaled corticosteroids *(LDIC)* + long acting beta-2 agonist *(LABA)*.
   - Alternatives:
     – Medium dose inhaled corticosteroids *(MDIC)*.
     – Low dose inhaled corticosteroids *(LDIC)* + leukotriene receptor antagonist *(LRA)*.
     – Low dose inhaled corticosteroids *(LDIC)* + theophylline.
4. Step 4 (severe persistent):
   - High dose inhaled corticosteroids *(HDIC)* + long acting beta-2 agonist *(LABA)*.
   - If needed, add LRA.
   - If needed, add theophylline.
   - If needed, add long term oral steroids 2 mg/kg/day (not exceeding 60 mg/day).
   - Repeated trials to reduce oral steroids (keeping high dose inhaled steroids).
5. Step down:
   Review treatment every 1-6 months for gradual reduction.
6. Step up:
   If not controlled (review medication technique, compliance and environment first).

C. Avoidance of triggering stimuli:

➢ Avoidance of exposure to respiratory infections & common allergens:

1. Pollens.
2. Pets.

3. Mold.
4. Food.

➢ Others:

1. RSV.
2. Cold air.
3. Drugs.
4. Emotional excitement.
5. Smoke.

N.B. The common trend of avoiding certain foods as eggs and chocolates in all asthmatic patients is wrong.

D. Patient and family education about:

1. Nature of the disease and prognosis.
2. How to avoid triggering stimuli.
3. What to do in acute attacks.
4. Correct use of inhalers and nebulizers.

---

8. Mention common causes of wheezing in infancy and childhood.

= DD of asthma.

A. Acute non recurrent wheezing (wheezing for the 1st time):

1. Acute bronchiolitis (**commonest** cause of wheezing in **infants**).
2. Severe bronchopneumonia with generalized obstructive emphysema.

B. Chronic persistent or recurrent wheezing:

1. Bronchial asthma (**commonest** cause of wheezing in **children**):
   Never diagnose asthma from the 1st attack.
2. Chronic or recurrent infections:
   - Cystic fibrosis.
   - Immunodeficiency.
3. Recurrent aspiration as in GERD.
4. Foreign body inhalation:
   - Sudden onset of wheezing.
   - No response to bronchodilators.
5. **C**ongenital anomalies.
6. **C**ompression of airways by:
   - Cysts.
   - Enlarged LNs.
   - Tumors.

---

9. Mention the cause of cystic fibrosis, its clinical picture in different pediatric age groups and lab findings.

➔ *Definition:*

Autosomal recessive mutation of the gene **C**ystic **F**ibrosis **T**ransmembrane **R**egulator (**CFTR**), leading to abnormal ion transport across the epithelial cells of exocrine glands, resulting in:

- Increased viscosity of secretions.

- Excessive concentration of sodium and chloride in the sweat.

N.B.

The gene is located on chromosome number **7** (MCQ).

➔ *Clinical picture:*

A. Infancy:

1. Meconium ileus in newborn period.
2. Prolonged neonatal jaundice.
3. Failure to thrive.
4. Recurrent chest infections.
5. Malabsorption and steatorrhea.

B. Young child:

1. Bronchiectasis.
2. Rectal prolapse.
3. Nasal polyp.
4. Sinusitis.

C. Older children and adolescents:

1. **A**llergic **B**roncho-**P**ulmonary **A**spergillosis (ABPA).
2. Diabetes mellitus (often not insulin-dependent).
3. Cirrhosis and portal hypertension.
4. **D**istal **I**ntestinal **O**bstruction **S**yndrome (DIOS) *"meconium ileus equivalent"*.
5. Pneumothorax or recurrent hemoptysis.
6. Sterility in males.
7. Increasing psychological problems.

➔ *Investigations:*

Sweat chloride test (sweating is stimulated by pilocarpine).

➔ *Treatment:*

1. Prevention/treatment of lung infections by: inhaled mucolytics and tobramycin.
2. Treatment of malabsorption:
   - Infant → predigested formula.
   - Child → exocrine pancreatic enzyme supplements, fat soluble vitamins and high caloric diet (double).
3. Liver transplantation with or without heart-lung transplantation.

---

10. Mention the common causes of cough in infancy and childhood.
List causes and differential diagnosis of acute cough in an infant.

➔ *Definition:*

- The most common symptom of respiratory disease.
- Caused by irritation of nerve receptors in pharynx, larynx, trachea and bronchi.

➔ *Etiology:*

1. Acute cough (duration less than 2 weeks):

➢ Without respiratory distress:

a. Acute bronchitis.
b. Acute laryngitis.

c. Acute sinusitis.

- With respiratory distress:
  a. Acute bronchiolitis.
  b. Pneumonia.
  c. Acute asthmatic attack.

2. *Prolonged cough (duration between 2 weeks and 2 months):*
   a. Complicated bronchitis:
      - Bacterial bronchitis.
      - Segmental collapse.
      - Pneumonia.
   b. Sinusitis (due to postnasal discharge).
   c. Pertussis (whooping cough) & pertussis-like illness.
3. *Chronic cough (duration more than 2 months):*
   a. Chronic infections:
      - Pulmonary tuberculosis.
      - Bronchiectasis.
   b. Chronic or persistent asthma.
   c. Recurrent aspiration.

N.B.

Write some points related to all diseases mentioned in details in the chapter (i.e. definition & clinical picture in brief).

OTHER TOPICS:

1. **Acute bronchiolitis.**

➔ *Definition:*

Lower respiratory tract infection characterized by inflammation of the small airways (terminal bronchioles).

➔ *Incidence:*

Commonest cause of respiratory distress and wheezes in infancy (first 2 years).

➔ *Causative organism:*

1. Respiratory syncytial virus (80%).
2. Others:
   a. Parainfluenza virus.
   b. Adenovirus.
   c. Human metapneumovirus.

➔ *Mode of transmission:*

Droplet infection.

➔ *Pathogenesis:*

Inflammation of the wall of bronchioles with secretions inside the wall → narrowing, air trapping and wheezes.

➔ *Clinical picture:*

A. Symptoms:

1. Prodroma:
   Mild upper respiratory tract infection symptoms (3 days).

Then:

2. Dry cough.
3. Respiratory distress.
4. Wheezes.
5. Feeding difficulty.

B. Signs:

1. Respiratory distress:
   Grade I: tachypnea (rapid respiration and working alae nasi).
   Grade II: intercostal and subcostal retractions.
   Grade III: expiratory grunting.
   Grade IV: cyanosis and respiratory failure.
2. Hyperinflation of the chest.
3. Expiratory wheezes.

➔ *Prognosis:*

- Recovery in few days.
- Case fatality is less than 1%.

➔ *Investigations:*

1. **RSV antigen detection** from nasopharyngeal secretions.
2. **Chest x-ray**: hyperinflation of lungs with focal atelectasis.
3. Blood gases**: hypoxia and CO_2 retention**.

4. **Pulse oximetry.**
5. Monitoring for apnea by monitor.

➔ *Treatment:*

1. Minimal or no respiratory distress:
   a. Close observation.
   b. Steam inhalation maybe beneficial.
   c. Careful feeding (avoid aspiration).
2. Severe cases:
   a. Hospitalization.
   b. Humidified oxygen and IV fluids.
   c. Mechanical ventilation (when support fails).

N.B.

- Good hand hygiene is important to prevent cross-infection as RSV is highly infectious.
- Non effective measures:
  Bronchodilators, antibiotics, antiviral drugs and steroids (not helpful).

---

2. Pertussis (whooping cough) (100 day cough)

➔ *Causative organism:*

Bordetella pertussis (bacteria).

➔ *Incidence:*

Rare; because of its compulsory vaccine.

➔ *Clinical picture:*

3 stages:

1. *Catarrhal stage (1 week):*
   a. Fever.
   b. Cough.
   c. Coryza.

   "Gradually progressive".
2. *Paroxysmal stage (2-4 weeks):*
   a. Paroxysmal attacks of spasmodic cough, more at night.
   b. Each attack consists of series of 5-10 forceful cough, followed by inspiratory whoop and lasts for 10-20 minutes.
   c. Followed by vomiting of large amount of viscid sputum.
   d. In infants:
      No whoops, but apnea is common and series (maybe fatal).
3. *Convalescent stage (1 week to several months):*
   Cough and vomiting decrease.

➔ *Complications:*

1. Pneumonia, activation of TB focus and bronchiectasis.
2. Pneumothorax.
3. Hernia and rectal prolapse.
4. Subconjunctival hemorrhage.
5. Convulsions, intracranial hemorrhage and sudden death.

➔ *Investigations:*

1. Rapid antigen detection from nasal swap.
2. CBC: absolute **lymphocytosis** (above 20.000).
3. Culture from nasal swap.

➔ *Differential diagnosis:*

Adenovirus infection (pertussis-like illness):

- Less marked lymphocytosis.
- Vaccinated child.

➔ *Prevention:*

Vaccine (discuss as in vaccination chapter):

Reduces incidence and severity but not completely protective.

➔ *Treatment:*

1. Oral erythromycin (also given to family and school contacts):
   - If given in catarrhal stage → prevents progression of the disease.
   - If given in paroxysmal stage → reduces family spread.
2. Infant:
   Hospitalization and ventilation.
3. Symptomatic treatment:
   Mucolytics and sedatives.
4. Treatment of complications:
   Mechanical ventilation in infants.

---

3. Lung abscess.

➔ *Definition:*

Suppurative destruction of lung parenchyma with formation of a cavity with pus.

➔ *Etiology:*

1. Foreign body aspiration.
2. Secondary to:
   a. Pneumonia: aerobic pyogenic bacteria (staph and pseudomonas).
   b. Bronchiectasis.
   c. TB.
   d. Amoebic lung abscess.
   e. Metastatic lung abscess (secondary to infective endocarditis of the right side or septic thrombophlebitis).

➔ *Clinical picture:*

A. Symptoms:

1. General manifestations of toxemia:
   a. Fever.
   b. Clubbing of fingers.
   c. Anorexia and weight loss.
2. Respiratory symptoms:
   a. Cough with sputum which is:
      – Foul-smelling.

- Purulent.
- Copious.
- Shows postural variation.

b. Maybe hemoptysis.

B. Signs:

Localized bronchial breathing.

➔ *Complications:*

1. Bronchiectasis.
2. Spread (local or systemic).

➔ *Investigations:*

1. Chest x-ray or CT (better):
   Cavity with air fluid level.
2. Bronchoscope.
3. Sputum culture.

➔ *Treatment:*

1. Broad spectrum antibiotics:
   - Covering staph (cloxacillin, vancomycin, amikacin).
   - For 4-6 weeks.
2. Bronchoscope for suspected foreign body.
3. Physiotherapy.
4. Surgical resection of affected lobe in chronic cases or in cases with severe hemoptysis.

---

4. Extra-pulmonary TB.

A. Tuberculous lymphadenitis:

- **Cervical lymph nodes** are the **most commonly** affected.
- Initially the LNs are discrete, mobile and not tender.
- Later they become matted and adherent to the deep structures and skin.
- Cold abscess may form and rupture → outpouring of caseous material.

B. Intra-abdominal Tuberculosis:

1. Tuberculous enteritis.

- Main symptoms: tenesmus, chronic diarrhoea with some bleeding.
- Stools are whitish and greasy.

2. Tuberculous peritonitis:

Infection from mesenteric lymph nodes, 4 types:

a. Ascetic type: with high protein content and many cells esp. **lymphocytes.**
b. Caseous type: with doughy sensation of the abdomen.
c. Adhesive type or dry type: the loops of intestine shows adhesions, the omentum is thickened and rolled on itself.
d. Encysted type: small effusions and caseous masses are encysted between loops.

3. Tuberculous mesenteric lymphadenitis (tabes mesenterica):

Enlarged matted glands, usually palpable in right iliac fossa.

C. Urogenital tuberculosis:

- Renal tuberculosis results from hematogenous spread of tubercle bacilli.

- Bacilli are released in urine and may spread to renal pelvis, ureters, bladder, prostate, seminal vesicles and epididymis in males.
- Examination of urine will reveal sterile pyuria but culture for TB is often +ve.

D. CNS tuberculosis:

1. *Tuberculous meningitis:*
   - Usually of hematogenous origin with or without miliary TB.
   - Clinically: headache, irritability, bizarre behaviour, disorientation.
   - Later: convulsions, disturbed consciousness and focal neurological sign appear.

     CSF: increased proteins, very low glucose, increased lymphocytes (250-500/mm^3) *"Mono-nuclear pleocytosis = ++WBCs"* with opalescent appearance.

   N.B.

   Discuss as in neurology chapter.
2. *Tuberculoma of CNS:*

- Caseous lesion large enough to act as space occupying lesion.
- Cranial CT: may show more than one mass.

E. Skeletal Tuberculosis:

1. *Pott's disease (TB of vertebral column):*
   - **Most commonly** in **lower thoracic** then lumbar then cervical regions.
   - It affects body of one or more vertebrae resulting in destruction of bones.
   - Kyphosis is most common in mid-thoracic lesions.
   - Radiological examination shows rarefaction and destruction of bones.
2. *Tuberculous arthritis:*
   - May affect the hip joint, ankle, knees and elbow joint.
   - Severe pain exacerbated at night with limitation of movement
   - X-ray reveals rarefaction and destruction of bones near the affected joint.

F. Other forms of TB:

- Tuberculous pericarditis (serous type "common" and constrictive type).
- Tuberculosis of the skin (lupus vulgaris): lips, nose, limbs and genitalia.
- Tuberculosis of the eye or ear: conjunctivitis, chronic otitis media and mastoiditis.

---

3. Upper respiratory tract infections.

A. Acute nasopharyngitis (common cold/coryza)

➔ *Incidence:*

Most common infection in children.

➔ *Causative organisms:*

1. Mostly viral:
   - Rhinovirus (most common).
   - Corona virus.
2. Maybe bacterial:
   - Hemophilus influenzae.
   - Staphylococcus.
   - Others.

➔ *Clinical picture:*

1. Fever:
   - Low grade.
   - Subsides in 2 days.
2. Nasal discharge:
   - Watery then mucoid.
   - Subsides in 1 day.
3. Nasal block:
   Interferes with feeding.
4. Pharyngeal examination:
   Congestion.

➔ *Complications (uncommon):*

1. Spread of infection:
   - Otitis media.
   - Sinusitis.
   - Acute bronchitis.
   - Acute bronchiolitis.
   - Pneumonia.
2. Prodroma of more serious disease as:
   - Measles.
   - Pertussis.
3. Precipitate asthma.

➔ *Treatment:*

1. Antipyretics as paracetamol and ibuprofen for fever and pain.
2. Decongestants.
3. Antibiotics are of no benefit, except if bacterial infection is suspected.

B. Acute otitis media

➔ *Causative organisms:*

1. Mostly bacterial:
   - Pneumococci & hemophilus influenzae (**50% of cases**).
   - Staph.
   - Branhamella catarrhalis.
   - Strept. pyogenes.
2. Viral:
   Very rare.

➔ *Clinical picture:*

1. Fever:
   High grade.
2. Irritability and earache:
   Continuous crying and ear rubbing.
3. Ear discharge (pus) if drum is perforated.
4. Otoscopy:
   Bright red and bulging eardrum.

➔ *Complications:*

1. *Ear complications:*
   a. Drum perforation (acute or chronic).
   b. Chronic suppurative otitis media (hearing loss).
   c. Chronic secretory otitis media (hearing loss).
2. *Skeletal complications:*
   a. Acute or chronic mastoiditis:
      Red, swollen, painful mastoid.
   b. Petrositis:
      Infection of pneumatized cells of temporal bone.
3. *Neurological complications:*
   a. Meningitis or focal otitic encephalitis.
   b. Acute cerebral thrombophlebitis (acute hemiplegia).

➔ *Treatment:*

Oral broad spectrum antibiotics:

- Ampicillin/sulbactam or amoxicillin/clavulanic acid.
- 50 mg/kg/day for 7-10 days.

C. Acute tonsillitis

➔ *Incidence:*

Common infection in children above 2 years.

➔ *Causative organisms:*

1. Main causes:
   - Group A beta hemolytic streptococci.
   - Adenovirus.

   "See table below"
2. Less common causes:
   a. Diphtheria.
   b. Infectious mononucleosis.

	Streptococcal pharyngitis	**Viral pharyngitis**
Symptoms:	- High fever. - Severe sore throat. - Vomiting and abdominal pain.	- Mild fever. - Moderate sore throat. - Rhinitis, conjunctivitis and hoarseness.
Signs:	- Congested tonsils and pharynx. - Follicles or membrane. - Tender cervical LNs.	- Mild erythema of tonsils and pillars. -Small ulcers on pillars and posterior pharyngeal wall.
Complications:	Spread: peri-tonsillar abscess. Late: rheumatic fever and glomerulonephritis.	
Treatment:	Oral penicillin or procaine	Symptomatic (antipyretics and

	penicillin or erythromycin for 7-10 days.	decongestants).

IMPORTANT NOTES:

1- Most common causative organism of acute nasopharyngitis is rhinovirus
2- Most common cause of acute cough in children is acute bronchitis
3- Most common causative organism of acute bronchitis → respiratory syncytial virus
4- Bronchodilators, antibiotics, antivirals are NON-EFFECTIVE in TTT of acute bronchitis
5- Most common bacteria below 6 years causing pneumonia → pneumococci
   above 6 years → mycoplasma
   Most common at all → respiratory syncytial virus
6- X-ray of lung abscess → air fluid level
7- X-ray of bronchiectasis → honeycomb or soap bubble
8- Most common site for pot's disease → lower thoracic / kyphosis is common in mid thoracic

GIT

ESSAY QUESTIONS:

1. **Enumerate causes of acute abdominal pain in children. Mention five investigations to be done when recurrent.**

Abdominal pain in general is the most common pediatric complaint

➔ *Causes of acute abdominal pain:*

A. Acute abdominal infections:

Diagnosis: fever – systemic manifestations + site of pain and tenderness.

1. Streptococcal pharyngitis (associated mesenteric adenitis).
2. Acute gastroenteritis.
3. Acute hepatitis.
4. Acute appendicitis.
5. Acute pyelonephritis.
6. Acute pancreatitis.
7. Acute peritonitis.
8. Acute cholecystitis.

B. Acute medical conditions: (DD by medical signs)

1. Henoch-schonlein vasculitis.
2. Sickle cell anaemia.
3. Right lower lobe pneumonia.
4. Acute rheumatic fever.
5. Diabetic ketoacidosis.
6. Drug intoxication.
7. Lead poising.

C. Surgical causes

1. Acute intestinal obstruction:

- C/P: vomiting is bile stained,.
- Abdominal x-ray: multiple fluid levels.

a. Incarcerated inguinal hernia.
b. Intussusception.
c. Volvulus.
d. Impacted faecal masses.
e. Round worm masses.

2. Other surgical causes of AA:

a. Inflamed Meckel's diverticulum.

- Definition: ileal remnant of vitello-intestinal duct.
- Incidence: 2%.
- Histology: contains ectopic gastric mucosa or pancreatic tissue.
- Clinical picture: asymptomatic or bleeding per rectum, intussusception,

diverticulitis (mimic appendicitis).

- Investigation: technetium scan (increased uptake by ectopic gastric mucosa).
- Treatment: surgical resection.

b. Acute appendicitis.
c. Renal stones.
d. Gall bladder stone.

NB:

اكتب جملة عن كل مرض مشروح قبل كده في chapter تاني زي Henoch-Schonlein purpura مثلا.

➔ *Investigations when it is recurrent:*

A. Routine investigations:
   1. Urine analysis.
   2. Stool analysis.
   3. CBC.
   4. Abdominal x-ray.

B. Further investigations:

1. Abdominal sonar.
2. IVP (intra venous pyelogram).
3. Upper and lower endoscopy.

---

2. Discuss diagnosis and management of recurrent non-organic abdominal pain.
List causes of recurrent abdominal pain of organic origin.

	Dysfunctional recurrent abdominal pain "non-specific" or "psychogenic"	**Organic recurrent abdominal pain**
Definition	Pain that does not interfere with child activity or general health.	Pain that interrupt child normal activity and health.
Incidence	> 90%.	Less than 10%.
Pain	- Periumbilical. - Non-localized, vague. - Not severe. - Subsides spontaneously in less than 20 minutes.	- Localized, away from umbilicus. (e.g. loin pain in renal calculi). - Severe. - Doesn't improve spontaneously.
Association	No.	Diarrhea, constipation, rectal bleeding, hematuria, dysuria.
Signs	- Child appears healthy. - No mass or tenderness.	- Weight loss, anemia. - Organomegaly or local tenderness.
Causes	1. Stressful events: loss of a parent, delivery of new sibling, school phobia. 2. Sympathy gaining.	**Common causes:** 1. Parasitic infestation: giardiasis, amoebiasis. 2. Chronic constipation.

	3. Simulate an adult with recurrent abdominal pain.	3. Bad selection of food. 4. Lactose intolerance. 5. Chronic use of drugs. Uncommon and rare causes: 1. Peptic ulcer. 2. Sickle cell anemia. 3. Inflammatory bowel disease. 4. Chronic hepatitis. 5. Renal calculi. 6. Familial Mediterranean fever.
Simple investigations (urine, stool, CBC, abdominal x-ray)	Normal.	Abnormal.
Further investigations	Not needed.	According to clinical suspicion (abdominal US, IV pyelography, endoscopy).
Treatment	Reassurance.	According to cause.

4. Enumerate causes of vomiting in different age groups.

➔ *Definition:*

- Forceful expulsion of gastric contents via the mouth.
- Regurgitation: passive moderate frequent losses.
- More proximal obstruction shows early and severe vomiting.

➔ *Causes:*

A. Vomiting in doing well neonate	*B. Vomiting in sick baby*
1- **Mucoid:** amniotic gastritis (1st few days). 2- **Bloody:** Hemorrhagic disease of newborn (1st few days). Swallowed maternal blood. 3- **Milk:** over feeding or GERD (after 1st week & persists).	1- **Medical:** - Serious infections (as meningitis, septicemia) - Increased intracranial pressure (hge). - Metabolic: galactosemia. - Renal failure. - Congenital adrenal hyperplasia. 2- **Surgical:** a- **Non-bilious:** - Esophageal atresia (with 1st feed). - Congenital hypertrophic pyloric stenosis (after 2 weeks). b- **Bilious:** - More proximal obstruction → earlier & severe vomiting. - Intestinal obstruction dt.: 1- Duodenal atresia 2- Small gut lesion e.g. atresia, stenosis, volvulus.

	3-	Large gut lesion as Hirschsprung disease.
	4-	Imperforate anus.

C- Vomiting in infancy:

1) Dietary errors:
   - Over feeding.
   - Increased carbohydrate in diet.
   - Irregular feeding or tight abdominal binder.
2) Infections:
   - Gastroenteritis.
   - Appendicitis.
   - Urinary tract infection.
   - Respiratory infections: otitis media, whooping cough.
   - CNS infections: Meningitis, encephalitis.
3) Medical disorders:
   - Celiac disease.
   - Renal failure.
   - Metabolic disease.
   - Increased intracranial tension.
   - Diabetic ketoacidosis.
4) Intestinal obstruction:
   - Intussusception.
   - Volvulus.
   - Adhesions.
   - Strangulated inguinal hernia.
   - Foreign body and bizarre eating (pica).

---

5. Define intussusception, mention its clinical picture, investigations and treatment.

➔ *Definition:*

Invagination of proximal bowel into distal segment (most commonly ileo-cecal).

➔ *Incidence:*

Most common cause of intestinal obstruction (3 months – 3 years).

➔ *Pathogenesis:*

Obstruction of mesenteric veins leading to congestion and bleeding, followed by necrosis.

➔ *Causes:*

1. Unknown in infancy.
2. Above 2 years:
   a. Viral gastroenteritis (enlarged peyer's patches).
   b. Meckel's diverticulum.
   c. Polyps.

➔ *Clinical picture:*

A. Symptoms:

1. Vomiting occurs in most cases (more frequent early).

2. Severe paroxysmal colicky abdominal pain (with loud crying, pallor & drawing legs over abdomen).
3. In 12-24 hours: red currant jelly stool (with blood & mucus).

B. Signs:

1. Bimanual palpation: sausage-shaped mass, mostly in upper right quadrant.
2. Rectal examination: bloody mucus on the finger.
3. 1-2 days later: infant will pass into shock-like state with bilious vomiting, abdominal distension & high fever.

➔ *Investigations:*

1. Plain erect x-ray:
   - Air-fluid level.
   - Dilated loops of small intestine.
   - Absent gases in distal colon.
2. Abdominal x-ray with gastrografin enema:
   - Arrest of barium in the colon (coil spring or claw sign).
3. Abdominal ultrasound.

➔ *Treatment:*

- Intravenous fluids (nothing per oral).
- Early: simple reduction (hydro or pneumo-reduction), 75% success.
- Operative reduction as early as possible.
- Late cases: resection anastomosis.

---

6. Enumerate causative organisms of infective diarrhea.
List causes of acute diarrheal illness.

➔ *Definition:*

- Increased frequency and/or fluidity of stool than usual for less than 2 weeks.
- Diarrhea is responsible for about 50% of infant morbidity and mortality.

➔ *Causes of acute diarrhea:*

A. Acute infective diarrhea (gastroenteritis):

Most common cause of diarrhea in infants and children.

1. Bacterial agents (more serious, common in summer):

- Campylobacter jejuni.
- Shigella.
- Salmonella.
- coli.
- Staphylococci.
- Yersinia enterocolitica.
- Cholera.

2. Viral agents (less serious, common in winter):

- Rotavirus.
- Enterovirus.
- Adenovirus.
- Circovirus.

- Astrovirus.

3. *Parasitic agents (not severe):*
   - Entamoeba histolytica.
   - Giardia lamblia.

B. Acute non-infective diarrhea:

1. *Dietetic diarrhea:*
   Overfeeding or inappropriate food for age.
2. *Drug-induced diarrhea:*
   Antibiotics esp. oral ampicillin.
3. *Parenteral diarrhea:*
   With respiratory or urinary tract infection.

Organisms of infective diarrhea:

Acute: See above.

Chronic: TB and giardia.

Persistent: Secondary infection (bacterial overgrowth).

---

7. Enumerate complications of acute severe gastroenteritis. State briefly the mechanism(s) and treatment of each one.

➔ *Complications:*

1. *Dehydration:*
   Discussed later.
2. *Shock:*
   - Cause:
     Hypovolemic shock, septic shock.
   - Manifestations:
     Tachycardia, hypotension, poor peripheral perfusion.
   - Management:
     - IV fluids & inotropic agents.
     - Septicemia is managed by combined parenteral antibiotics.
3. *Acute renal failure:*
   - Cause:
     Reduced renal perfusion (pre-renal failure).
   - Manifestations:
     Oliguria or anuria.
   - Investigations:
     Blood urea and creatinine.
4. *Metabolic acidosis:*
   - Cause:
     Loss of alkali, tissue hypoperfusion.
   - Investigation:
     Blood gases.
   - Manifestations:
     Deep rapid respiration (acidotic breathing).

- Management:
  4 ml/kg bicarbonate solution (5%).

5. *Hypokalemia:*
   - Cause:
     Increased intestinal loss.
   - Manifestations:
     Abdominal distension and paralytic ileus.
   - Investigation:
     Serum electrolytes.
   - Management:
     - Potassium chloride solution 15% is added in amount of 1 ml for each 100 ml of deficit and maintenance IV rehydration solutions.
     - KCl is also a component of oral rehydration solution.
6. *Hypocalcemia:*
   - Cause:
     Increased intestinal loss.
   - Manifestations:
     Tetany (carpo-pedal spasm) and convulsions.
   - Investigation:
     Serum electrolytes.
   - Management:
     IV calcium gluconate 10% 1 ml/kg slow IV infusion.
7. *Disseminated intravascular coagulation (DIC):*
   - Manifestations:
     Bleeding and infarctions.
   - Investigations:
     Platelet count, prothrombin time & FDPs.
8. *Convulsions:*

- Causes:
  - Febrile.
  - Toxic.
  - Metabolic (hypocalcemia, hypo or hypernatremia).
- Management:
  0.5 mg/kg diazepam slow infusion.

9. *Persistent diarrhea:*
   - Due to post-enteritis malabsorption or giardiasis.
   - Discussed later.
10. *Malnutrition:*
    - Diminished calories (marasmus), feeding with excess carbohydrates (kwashiorkor).
    - Details in nutrition chapter.

---

8. Explain how degree of dehydration can be estimated in a child.
Describe, in table, clinical assessment of different grades of dehydration.

➔ *Definition of dehydration:*

Loss of water and electrolytes from extracellular fluids (ECF) and intracellular fluids (ICF).

➔ *Grades:*

	Mild	**Moderate**	**Severe**
Body weight loss	< 5%	5–9%	10% or more
General	Normal (alert)	Irritable, fatigue	Drowsy, coma
Pulse	Normal	Normal / weak	Weak / impalpable
HR	Normal	Normal / increased	Tachy / brady
B.P.	Normal	Normal / low	Low
Respiration	Normal	Deep + or – rapid	Deep & rapid
Anterior fontanel	Normal	Slightly sunken	Deeply sunken
Eye	Normal	Slightly sunken	Deeply sunken
Skin turgor	Normal	Recoil < 2 sec	More than 2 sec
Mucous membranes	Moist	Dry	Very dry (woody)
Urine output	Normal	Reduced	Marked oliguria
Tears	Present	Reduced	Absent
Capillary refill	Normal	Prolonged > 2 sec	Prolonged > 2 sec
Extremities	Warm	Cold	Mottled

---

9. Compare between hypotonic & hypertonic dehydration.
Enumerate causes and discuss types of dehydration.

➔ *Definition of dehydration:*

Loss of water and electrolytes from extracellular fluids (ECF) and intracellular fluids (ICF).

➔ *Types of dehydration:*

	Isotonic (isonatremic)	**Hypertonic (hypernatremic)**	**Hypotonic (hyponatremic)**
Incidence	75%	15%	10%
Patho-physiology	Loss of water & electrolytes at the same ratio.	Loss of water more than electrolytes.	Loss of electrolytes more than water.
ECF tone	Isotonic.	Hypertonic.	Hypotonic.
Fluid shift	No shift.	ECF pull water from ICF.	ICF pull water from ECF.
ICF	No change.	Cellular dehydration.	Cellular edema.
ECF	Moderately reduced.	Mildly reduced.	Severely reduced.
Causes	Gastroenteritis.	- DKA. - High fever. - Hot environment. - Excess sweating.	Prolonged diarrhea when replaced by drinking water or hypotonic solution.
Skin turgor *Fontanel* *Eye*	Poor. Depressed. Sunken.	Fair. Mildly depressed. Mildly sunken.	Very poor. Very depressed. Very sunken.
Tongue	Normal.	Dry.	Moist.

CNS	Normal.	Irritability, seizures & intracranial hemorrhage.	Lethargy & coma.
Serum Na^+	130-150 mEq/L	> 150 mEq/L	< 130 mEq/L

10. Management of diarrhea & dehydration.

i. Home management (mild to moderate dehydration):

1. Oral rehydration solution (ORS):

Composition of each packet	When dissolved in 1000 ml water
Sodium chloride (3.5 gm)	Na^+ (90 mEq/L)
Sodium citrate (2.5 gm)	K^+ (20 mEq/L)
Potassium chloride (1.5 gm)	Cl^- (80 mEq/L)
	Citrate (30 mEq/L)
Glucose (20 gm)	Glucose (111 mEq/L)

- *Advantages:*
  - Cheap, available, simple preparation, safe.
  - Effective in all types of diarrhea.
  - Effective in all types of dehydration.
  - Effective for all age groups.
- *Mechanism of action:*

  Glucose-facilitated sodium transport.
- *Amount:*
  - 50-100 ml/kg in 4-6 hours.
  - Thirst mechanism regulates the amount of fluid.
- *Method:*
  - Give a spoon every 1 minute.
  - Nasogastric tube if the child is (unconscious, refusing spoon rehydration).

2. Feeding:

"Give reason: delayed feeding is not recommended during management of acute gastroenteritis".

- **Should start** as early as possible after oral rehydration solution (prolonged starvation affects integrity of the mucosa that result in persistent diarrhea "post-enteritis diarrhea").
- Promote **breast milk** feeding (gradually increase the amount).
- **Formula-fed** baby: start with diluted formula and gradually increase concentration.
- **Food-dependent** child: start with easily digested solid food (boiled vegetables, soft jellies & fruits).

3. Symptomatic treatment:

- **Fever:** antipyretic (paracetamol).
- **Vo**miting: anti-emetic (metoclopramide).
- **Diarrhea**: no role of antidiarrheal drugs.

4. Treatment of infections:

- **Giardia lamblia**: oral metronidazole 25 mg/kg/day for 7 days.
- **Entamoeba histolytica**: oral metronidazole 50 mg/kg/day for 7 days.

- **Bacterial enteritis**: antibiotics:
  - Severe dysentery (shigella): cotrimoxazole.
  - Severe systemic toxemia: IM/oral amoxicillin (50 mg/kg/day) or amikacin.

ii. Hospital management of severe complicated cases:

➢ *Indications:*

1. Deterioration **on home** management (failure of ORS).
2. Persistent vomiting with **moderate** dehydration.
3. **Severe** dehydration (> 10% of body weight).
4. **Serious complications** as septicemia, acidosis or bleeding.

1. Intravenous rehydration:

Given over 24 hours and includes 3 steps:

- Shock therapy (1st hour):
  20 ml/kg Ringer's lactate or saline over 30 minutes (maybe repeated).
- Deficit therapy (8 hours):
  100 ml/kg of glucose : saline (1:1).
- Maintenance therapy (15 hours):
  100 ml/kg of glucose : saline (4:1).
- Potassium chloride solution 15% is added in amount of 1 ml for each 100 ml of deficit maintenance solutions to correct hypokalemia.
- During next 24 hours, oral rehydration solution is tried.

2. Treatment of complications:

- **Septicemia:** combined parenteral antibiotic therapy.
- **Shock**: IV fluids & inotropic drugs.
- **Metabolic acidosis**: 4 ml/kg bicarbonate solution 5%.
- **Convulsions:** 0.5 mg/kg diazepam slow infusion.
- **Hypocalcemia:** IV calcium gluconate 10% 1 ml/kg slow IV infusion.

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11. Definition and causes of chronic and persistent diarrhea.
List causes of persistent diarrhea and how to manage each.

Chronic diarrhea

➔ *Definition:*

Increased frequency and/or fluidity of stool than usual for more than 1 month.

➔ *Causes:*

A. Chronic GIT infection:

1. TB (tuberculous enteritis):
   Clinical picture:
   - Tenesmus and chronic diarrhea with some bleeding.
   - Whitish greasy stool (characteristic).
2. Giardiasis.

B. Malabsorption syndromes:

1. Cholestasis (discuss, hepatology chapter).
2. Cystic fibrosis (discuss, respiratory chapter).
3. Achlorhydria.

4. Celiac disease:
   - Definition:

     Autoimmune disease induced by gliadin fraction of gluten of whey resulting in damage of proximal small intestinal mucosa and malabsorption.
   - Clinical picture:
     - Onset: with introduction of wheat at the age of 6 months.
     - Diarrhea.
     - Abdominal distension.
     - Failure to thrive.
     - Severe wasting in the limbs.
   - Investigations:
     - Anti-tissue transglutaminase antibodies.
     - Anti-gliadin antibodies.
     - Jejunal biopsy maybe needed.
   - Treatment:
     - Gluten-free diet for life.
5. Short bowel syndrome.
6. Lymphangectasia.
7. Inflammatory bowel disease.

Persistent diarrhea

➔ *Definition:*
- An acute attack of diarrhea persists for more than 2 weeks but less than 1 month.
- Diarrhea is increased frequency and/or fluidity of stool than usual.

➔ *Incidence:*

5-20% of acute diarrhea.

➔ *Causes:*

1. *Sugar intolerance:*
   - *Pathogenesis:*
     - Intestinal micro-villi contain disaccharidase enzymes (lactase, sucrose and maltase).
     - Infection destroys the brush border (micro-villi).
     - Malabsorption of disaccharides (esp. lactose) occurs → remain in the lumen → osmotic diarrhea with disaccharides in stool.
     - Fermentation of sugars by intestinal flora → production of organic acids.
   - *Clinical picture:*

     Watery stool with sugar and acid.
   - *Treatment:*

     Lactose-free formula.
2. *Cow milk protein allergy:*
   - *Pathogenesis:*

     Infection causes damage to intestinal wall allowing strange cow milk proteins to come in contact with submucosa → allergy.
   - *Clinical picture:*

     Diarrhea with mucus and occult or frank blood.

- *Treatment:*

  Replacement of milk by soy protein or protein hydrolysate.

3. *Overgrowth of bacteria in the upper small intestine:*
   - *Pathogenesis:*
     - Upper part of small intestine is sterile.
     - After acute diarrhea → fecal type of bacteria (mainly anaerobes and E. coli) may invade the upper small intestine → damage of mucosa, diarrhea & sugar intolerance.
   - *Investigation:*

     Stool culture → overgrowth of fecal type.
4. *Mucosal injury and atrophy:*

   Continuous mucosal injury and atrophy due to any of the above will impair digestion and absorption leading to vicious circle of:
   - Growth failure and malnutrition.
   - Increased susceptibility to infections.

➔ *Management:*

1. Removing the offending agent.
2. Antibiotics if suspected bacterial infection.
3. Vitamins, esp. vitamin A and trace elements (zinc).

---

12. Monilial stomatitis (causes, clinical picture & treatment).

Painful oral lesions.

	Monilial stomatitis (oral candidiasis or oral thrush)	**Herpetic gingivostomatitis (ulcerative stomatitis)**	**Herpangina**
Cause	Candida albicans (at birth or from infected nipple).	Herpes simplex virus.	Coxsackie virus.
Incidence	Neonatal period & infancy.	1-3 years.	Below 5 years.
Clinical picture			
Nature	White plaques, when removed leave bright inflamed base.	Ulcers (2-10 mm in diameter).	Around 5 ulcers (1-5 mm in diameter). (in severe cases, number may reach up to 15).
Site	Tongue, gingiva & oral mucosa.	Tongue, gingiva & oral mucosa.	Anterior tonsillar pillars. (in severe cases, may involve soft palate, uvula, tonsils & posterior pharyngeal wall).
Pain	Mild, may cause feeding difficulty.	Severe, with very difficult feeding.	Severe sore throat, with difficult feeding.

Fever	Absent.	High.	Present.
Duration	Less than 1 week.	4-8 days.	3-6 days.
Treatment	Antifungal drugs as nystatin or miconazole (Daktarin oral gel).	Symptomatic (analgesics & antipyretics).	Symptomatic (analgesics & antipyretics).

OTHER TOPICS:

1. **Chronic abdominal masses.**

1. *Hepatosplenomegaly:*

   See hepatology.

2. *Renal & suprarenal masses:*

   a. Wilms tumor.
   b. Neuroblastoma.
   c. Hydronephrosis.
   d. Renal vein thrombosis.
   e. Polycystic kidney.
   f. Cystic dysplastic kidney.

	Neuroblastoma	**Wilms tumor**
Origin	Supra-renal gland.	Kidney.
Onset	Below 3 years.	Around 3 years.
Mass site	Right or left upper quadrant mass.	
Mass character	- Hard. - Irregular surface. - Cross midline.	- Firm. - Smooth surface. - Doesn't cross midline.
Other manifestations	- Hepatomegaly. - Proptosis (retro-orbital infiltration). - Anemia (bone marrow infiltration). - Subcutaneous nodules.	Hematuria maybe present.
Investigations	Bone marrow biopsy: neuroblastoma in 70% of cases.	CT abdomen and biopsy.

3. *Pancreatic masses (non mobile):*

   a. Pancreatic pseudocyst: most common (caused by blunt trauma).
   b. Pancreatic cystadenoma.
   c. Retention cyst.

4. *Intestinal masses (mobile, mid-abdominal):*

   a. Intestinal cysts:

      Mesenteric or omental.

   b. Intestinal lymphoma:

      Maybe very huge – associated with ascites.

   c. Intestinal inflammatory masses:

      Tuberculous mesenteric adenitis "tabes mesenterica": enlarged matted lymph nodes usually palpable in right iliac fossa.

5. *Retro-peritoneal masses (upper or lower abdomen):*

   a. Teratoma.
   b. Rhabdomyosarcoma.

c. Lymphoma.

6. *Masses in females:*
   a. Ovarian causes: cysts or tumors.
   b. Uterine causes: hematometra or tumors.
   c. Vaginal causes: hematocolpos, hydrocolpos or tumors.

---

2. Acute abdominal masses.

1. *Intussusception (see before).*
2. *Fecal masses:*
   A. Symptoms:
   - Acute abdominal pain.
   - Acute constipation.

   B. Abdominal examination:
   - Sausage-shaped masses in left lower quadrant.

3. *Distended bladder:*
   A. Symptoms:
   - Acute abdominal pain.
   - Urine retention.

   B. Abdominal examination:
   - Globular supra-pubic tender cystic midline mass.
   - Firm pressure on the mass may lead to immediate urination.

---

3. Gastro-esophageal reflux disease (GERD).

➔ *Definition:*

Retrograde passage of gastric contents into the esophagus.

➔ *Etiology:*

1. Immaturity of lower esophageal sphincter (episodes of inappropriate relaxation).
2. Short intra-abdominal length of esophagus.

➔ *Incidence:*

- Common during 1st year of life.
- More severe cases maybe due to:
  - Cerebral palsy.
  - Preterm.
  - Diaphragmatic hernia.
  - Esophageal atresia.
  - Following abdominal surgery.

➔ *Clinical picture:*

1. Excessive vomiting & regurgitation.
2. Esophagitis: pain & irritability.
3. Recurrent aspiration: recurrent cough & wheezes.
4. Apnea in preterm.

➔ *Complications:*

1. Bleeding & maybe iron deficiency anemia.

2. Esophageal stricture from severe esophagitis.
3. Bronchitis or pneumonia (aspiration).
4. Apparent Life Threatening Event (ALTE).
5. Sudden Infant Death Syndrome (SIDS).
6. Dystonic movement of neck (Sandifer's syndrome).
7. Failure to thrive.

➔ *Investigations:*

"No need in mild typical cases"

1. 24-hours esophageal monitoring: diagnostic.
2. Upper GI endoscopy.
3. Contrast study of upper GIT.

➔ *Treatment:*

1. Mild:
   - Positioning: 30° head-up prone position after meals.
   - Thickening of feeds (with cereals).
2. Moderate:
   - Increase gastric emptying: domperidone.
   - Proton pump inhibitors as omeprazole to reduce esophagitis.
3. Severe:
   - Fundoplication in refractory cases or esophageal stricture.

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4. Congenital hypertrophic pyloric stenosis (CHPS).

➔ *Definition:*

Congenital hypertrophy of the pylorus causing gastric outlet obstruction.

➔ *Incidence:*

- More common in boys (4:1).
- More common in 1st born boy.
- +ve family history.

➔ *Etiology:*

Multifactorial.

➔ *Clinical picture:*

A. Symptoms:

1. Vomiting (after 2-7 weeks of age):
   - Projectile.
   - Non-bilious.
2. Constant hunger even after vomiting.
3. Diminished weight gain.

B. Abdominal examination:

1. Olive-like mass in right upper quadrant.
2. Test feeding: visible and palpable gastric peristalsis on breast or bottle feeding.

➔ *Investigations:*

1. Abdominal ultrasound to confirm diagnosis.
2. Barium meal in doubtful cases only.

3. Serum chemistry: hypokalemia, hyponatremia, hypochloremia with metabolic alkalosis (vomiting acidic gastric contents).

➔ *Treatment:*

1. Correct fluid and electrolyte imbalance (chloride and potassium).
2. Surgical correction: pyloromyotomy.
3. Start feeding in the next day.
4. Discharge after 2-3 days.

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5. Pathophysiology of gastroenteritis.

	Entero-toxigenic	**Entero-invasive**
Mechanism:	• Organism adheres to mucosal cells & secrete toxins. • ↓↓ Salt & H_2O absorption. • ↑↑ Intestinal secretion.	• Organism invades cells. • ↓↓ Salt & H_2O absorption. • Exudation of blood & pus.
Clinical picture:	• Watery diarrhea.	• Diarrhoea with pus & blood. • Fever, headache, anorexia & malaise.
Complications:	Severe dehydration & electrolyte imbalance.	Toxic manifestations.
Examples:	1. Enterotoxigenic E. coli 2. Cholera 3. Staph	1. Enteroinvasive E. coli 2. Salmonella, Shigella 3. Yersinia enterocolitica 4. Campylobacter jejuni

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6. Clinical diagnosis and investigations of acute diarrhea.

➔ *Clinical diagnosis:*

A. Severity of diarrhea:

- Mild: 4-6 motions per day (parasitic).
- Moderate: 6-10 motions per day (bacterial).
- Severe: > 10 motions per day (viral).

B. Suspecting the cause:

- <u>Watery diarrhea:</u>
  - Bacterial: E. coli (entero-toxigenic form), staph, cholera.
  - Viral: Rotavirus.
  - Parasitic: Giardia lamblia.
- <u>Bloody diarrhea (dysentery):</u>
  - Bacterial: Shigella, campylobacter, E. coli (entero-invasive form) "+++ *pus*".
  - Parasitic: Entamoeba histolytica "+++ *mucus*".
- <u>Loose:</u>
  - Bacterial or parasitic.

C. Fever:

- Low grade: viral.
- High grade: bacterial.
- No fever: parasitic.

D. Vomiting:

- Absent in Amoebiasis.
- Early and severe in Rotavirus infection.

➔ *Investigations:*

A. Causative organism:

1. Stool analysis: parasites (not for bacteria).
2. Stool culture: bacteria and viruses.

B. Complicated cases:

1. CBC (leukocytosis) and elevated ESR & CRP in bacterial diarrhea.
2. Blood gases: to detect metabolic acidosis.
3. Serum electrolytes: Na^{+}, K^{+} & Ca^{2+}.
4. Blood urea and creatinine: if renal failure is suspected.
5. Platelet count, prothrombin time & fibrin degradation products (FDPs): in DIC.

IMPORTANT NOTES:

1- Most common cause of chronic abdominal masses → hepatosplenomegaly
2- Wilms tumor → kidney tumor around age of 3 years
3- Red currant jelly stool → intussusception
4- Sausage shaped mass in right upper quadrant → intussusception
5- Sausage shaped mass in left lower quadrant → fecal mass
6- Diagnostic tool of gastro- esophageal reflux → 24 hours esophageal PH monitoring
→ Boys > girls in incidence → nephrotic syndrome
congenital hypertrophic pyloric stenosis
Henoch-Schonlein purpura
7- Olive like mass → congenital hypertrophic pyloric stenosis
8- Most common cause of bacterial gastroenteritis → campylobacter jujeni

Hepatology

SHORT ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **Describe clinical and laboratory differentiation of the causative agents of viral hepatitis.**
   Describe the laboratory diagnosis of acute viral hepatitis in children.
   Discuss the clinical picture and diagnosis of hepatitis A.
   Describe hepatitis markers antigens & antibodies.
   Describe the laboratory investigations of acute liver injury.

➔ *Causative organisms of viral hepatitis:*

1. Hepatotropic viruses:

	Hepatitis A (The commonest)	*Hepatitis B*	*Hepatitis C*	*Hepatitis D*	*Hepatitis E*
Type of virus:	RNA Enterovirus	DNA Hepadnavirus	RNA Flavivirus	RNA Incomplete (defective virus).	RNA Calcivirus
Transmission:	Feco-oral	Parenteral Vertical Sexual	Parenteral Vertical Sexual	Parenteral Vertical Sexual	Feco-oral
Incubation period:	2-6 weeks	2-6 months	1-5 months	3-6 weeks	2-9 weeks
Diagnostic test:	Anti HAV IgM	- HBsAg - Anti HBc IgM	- Anti HCV - HCV-RNA by PCR	- Anti HDV (IgM) - HDV Ag	Anti HEV (IgM)
Fulminant form:	Rare	Yes	Rare	Yes	Yes (esp. pregnant females)
Chronicity:	No	Yes	Yes (common)	Yes	No
Vaccine:	Yes	Yes	No	Yes (HBV)	No

NB. HDV can't produce infection alone (co-infection with HBV); as it has no surface coat.

2. Other non hepatotropic viruses:

Cause systemic manifestations & sometimes affect the liver:

a. Epstein-Barr virus.
b. Cytomegalovirus.
c. Herpes simplex virus.
d. Other viruses: as Rubella.

➔ *Clinical picture:*
Acute hepatitis can be present with one of 4 clinical types:

1. *Icteric hepatitis:*
   - Most common form in children.
   - 3 stages.
   a. *Pre-icteric stage (4-6 days):*
      – Constitutional symptoms: Mild **F**ever, **A**norexia, **H**eadache & **M**alaise.
      – GIT manifestations: abdominal pain, vomiting.
      – Urine usually becomes dark (bilirubinuria) during the last 1-3 days.
   b. *Icteric stage (2-4 weeks): icterus = jaundice*
      – Jaundice, dark urine & clay-colored stool.
      – Liver: enlarged & tender.
      – Manifestations of pre-icteric stage as fever, vomiting & abdominal pain disappear (but anorexia may persist).
   c. *Convalescence stage:*
      – Gradual decline of jaundice & decrease in liver size.
2. *Cholestatic hepatitis:*
   Marked obstruction of biliary flow leading to:
   Jaundice, **pruritus (bile acids) & marked clay-colored stool**.
3. *Anicteric hepatitis:*
   – More common in infancy.
   – Jaundice is absent.
   – Only GIT manifestations & constitutional symptoms: anorexia, vomiting, diarrhea & colic.
4. *Fulminant hepatitis (acute liver failure):*
   – More common in adults.
   – The least common type of hepatitis but the most serious (70% mortality).
   – Presented by:
      a. Progressive jaundice.
      b. Bleeding.
      c. Hepatic encephalopathy (rapidly developing coma).
      d. Later on, cerebral edema & hemorrhage from coagulopathy & sepsis.

➔ *Investigations: (investigations to diagnose, investigations of the cause & investigations of complications)*

1. *Investigations to prove acute hepatitis (liver cell injury): "to diagnose"*
   a. Bilirubin: direct or mixed hyperbilirubinemia.
   b. Elevated serum AST (aspartate aminotransferase) & ALT (alanine aminotransferase): levels between 100 & 1000.
   c. Urine analysis: bilirubin is present.
2. *Investigations to assess liver functions (exclude acute liver failure): "complication"*
   5A + BPH
   a. Rising **B**ilirubin level (above 10 mg/dl).
   b. Elevated serum liver enzymes (**A**ST & ALT) "markedly".
   c. Elevated **A**lkaline phosphatase.
   d. Low serum **A**lbumin (below 3 gm/dl) "late because of long half-life of albumin) & low

prothrombin concentration.

e. Prolonged **P**rothrombin time (more than 20 seconds).
   INR (international normalized ratio) = or > 2 and uncorrectable with vitamin K.
   or INR between 1.5 & 1.9, uncorrectable with vitamin K + encephalopathy.
f. High **A**mmonia level (>150 mcg/dl).
g. Metabolic **A**cidosis (acid-base & electrolyte disturbance).
h. **H**ypoglycemia.

3. *Investigations to diagnose the causative virus (hepatitis markers): "cause"*

i. Hepatitis A:
- Anti HAV antibodies (IgM class) → denotes recent infection.
- (IgG) class → denotes recovery and immunity.

ii. Hepatitis B:
- HBsAg (surface antigen), followed by anti HBc (core antibody) IgM → recent infection.
- Anti HBs antibodies → recovery & immunity.
- HBsAg persists, and anti HBc IgG develops → chronicity.

iii. Hepatitis C:
- Screening test: Anti HCV antibodies → exposure to infection (but doesn't denote recovery or immunity).
- Diagnostic & prognostic test: HCV RNA by PCR (antigen detection) → denotes viremia. Quantitative PCR → for assessment of viral load for treatment purposes.

iv. Hepatitis D:
- Anti HDV (IgM) & Hepatitis D virus antigen.

v. Hepatitis E:
- Anti HEV (IgM).

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2. Prevention of viral hepatitis.

1. *General measures:*

a. Hepatitis A:
- Isolation of acute cases from daycare or schools for 7 days after onset of jaundice (infectivity period).
- Strict hand washing, esp. after changing diapers & before preparation or serving food.

b. Hepatitis B, C & D:
- Strict screening of blood & blood products.
- Strict sterilization in all procedures in which there is contact with blood.
- Prevention of perinatal transmission during delivery of infected mothers.

2. *Specific measures (vaccination):*

a. Hepatitis A:
Potent inactivated vaccine is present (discuss from vaccination chapter).

b. Hepatitis B:
- Discuss vaccine from vaccination chapter.
- Routine immunization for newborns.
- Also given to high risk groups as thalassemic & hemophilic patients receiving repeated blood & blood products.
- Patients with chronic liver disease must be protected from super-added hepatitis A &

B.

– Perinatal transmission from carrier mothers must be prevented by maternal screening & giving the infant hepatitis B vaccine + hepatitis B immunoglobulins.

c. Hepatitis C & E:

No specific vaccine.

d. Hepatitis D:

Vaccination against HBV.

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3. Discuss causes, clinical picture and management of chronic hepatitis.

➔ *Definition:*

Continuing inflammatory liver disease more than 6 months.

➔ *Causes:*

1. Autoimmune hepatitis "2nd common".
2. Chronic viral hepatitis (B, C or D) "commonest cause".
3. Chronic inflammatory bowel disease (ulcerative colitis, sclerosing cholangitis).
4. Drug induced: Rifampicin, Isoniazid, and Nitrofurantoin.
5. Errors of metabolism as Wilson disease, alpha-1 antitrypsin deficiency and cystic fibrosis.
6. Non-alcoholic fatty liver disease:
   - Incidence: most common cause in developed countries.
   - Presentation: obese children, lethargy & right upper quadrant pain.

➔ *Clinical picture:*

a. Acute hepatitis which fails to resolve within 6 months.

b. Insidiously diagnosed in an asymptomatic child or present with:

   - Firm hepatomegaly.
   - Hepatosplenomegaly.
   - Symptoms of chronic liver cell failure:
     Jaundice – bleeding – ascites – spider nevi – palmar erythema.

- *Other symptoms of the cause:*
  - Neurological changes in Wilson.
  - Skin rash, arthritis, and hemolytic anemia in autoimmune disease.
  - GIT manifestation in ulcerative colitis.

➔ *Investigations:*

A. Investigations to assess liver function:

1. Bilirubin level (total & direct).
2. Enzymes: AST, ALT, alkaline phosphatase & gamma glutamyl transpeptidase.
3. Plasma proteins.
4. Prothrombin time, prothrombin concentration and INR

B. Investigations to search for the cause:

1. Laboratory:

a. In post-viral chronic hepatitis: hepatitis markers (e.g. persistence of HBsAg).

b. In autoimmune hepatitis:

- Hypergammaglobulinemia.
- Positive autoantibodies as anti-smooth muscle antibodies, anti-nuclear

antibodies (ANA) and liver/kidney microsomal antibodies (LKMs).

c. In metabolic disorders:

i. Wilson disease:

- Low serum ceruloplasmin.
- Excess urine copper.
- Kayser-Fleischer ring by slit lamp examination (copper accumulation in cornea).

ii. Alpha-1 anti-trypsin deficiency:

Alpha-1 anti-trypsin assay.

2. *Imaging:*

a. Ultrasound: assess liver texture and size, spleen, portal vein caliber and presence of ascites.

b. Doppler: assess portal vein patency, direction of blood flow and presence of porto-systemic anastomosis.

3. *Endoscopy:*

Upper GI endoscopy may show esophageal varices.

4. *Study of ascitec fluid tap.*

5. *Liver biopsy:*

Assess grade of inflammation and stage of fibrosis.

➔ *Complications:*

1. Cirrhosis and hepatocellular carcinoma esp. with chronic HBV & HCV infections.
2. Portal hypertension (esophageal varices, ascites).
3. End-stage liver disease: with growth failure and hepatic encephalopathy.

➔ *Treatment:*

A. *According to the cause:*

- **Prednisolone** and **azathioprine** in autoimmune hepatitis.
- Antiviral drugs (ribavirin- interferon) in viral hepatitis C.
- Wilson: D-penicillamine as copper chelating agent.

B. *Liver transplantation:*

- **Indication:** end stage liver disease.
- **Prognosis:** 80% survival with good quality of life.
- **Mechanism in children in Egypt**: living related donor.
- **Started in Egypt** in 2001.

C. *Liver supportive measures (see portal hypertension).*

---

4. Plan the laboratory approach to identify causes of cholestasis in infancy. (Sep. 2008) Discuss etiology and management of cholestasis. (2014)

➔ *Definition:*

- Failure of normal amount of bile to reach duodenum due to liver cause (impaired secretion by hepatocytes) or biliary cause (obstruction of bile flow through intra or extra-hepatic bile ducts).
- There is prolonged elevation of direct (conjugated) bilirubin (more than 20% of total bilirubin) + cholesterol & bile acids.

➔ *Causes:*

A. Intra-hepatic disease:

1. Liver cell injury:

a. Idiopathic or giant cell hepatitis:

- The commonest cause.
- Associated with IUGR.
- No evident etiology.

b. Infections:

- TORCH infections: CMV, Rubella, toxoplasma.
- Neonatal sepsis.
- Urinary tract infection.

c. Metabolic disorders:

- CHO metabolism: galactosemia.
- Amino-acid metabolism: tyrosinemia.
- Lipid storage disease: Niemann-Pick disease.
- Others: alpha-1 anti-trypsin deficiency & bile acid synthesis defect.

2. Familial cholestatic syndromes (paucity of intra-hepatic bile ducts):

- Progressive familial intrahepatic cholestasis (PFIC): type 1, 2 & 3.
- Benign recurrent intrahepatic cholestasis.
- Allagile syndrome:

  Paucity of intrahepatic bile ducts + congenital heart disease + vertebral & corneal anomalies + triangular face.

B. Extra-hepatic disease:

1. Extrahepatic biliary atresia (EHBA):

- The 2nd most common cause.
- Normal weight at birth.

2. Choledochal cyst:

- Cystic dilation of extrahepatic biliary system.

NB:

- The commonest causes are **idiopathic hepatitis** and **extrahepatic biliary atresia.**
- Early differentiation is important because early surgical correction in EHBA will prevent further liver damage.

➔ *Consequences of cholestasis:*

1. Decreased bile delivered to the intestine:

- Fat malabsorption.
- Deficiency of fat soluble vitamins (K, E, D and A).
- Pale or clay colored stool.

2. Retention of bile constituents:

- Jaundice.
- Pruritus (bile acids).
- Progressive liver damage by copper.

➔ *Clinical picture:*

A. History:

1. Present history:

Onset of jaundice: cholestasis should be considered in all cases with persistent jaundice for more than 2 weeks with clay colored stool and dark urine.

In biliary atresia:

- Jaundice is not evident immediately at birth but develops in the 1st 1-2 weeks of life.
- Stool is persistently pale or clay colored.
- Liver injury progresses rapidly to cirrhosis and portal hypertension.

In neonatal hepatitis:

- Jaundice, enlarged liver and ill-appearing infant (IUGR) are all evident at birth.

2. Prenatal history:

To exclude congenital infection (TORCH).

3. Family history of similar conditions and consanguinity in genetic causes.

B. Examination: (cause, disease & complications)

1. Hepatomegaly:

- Usually present.
- Huge liver suggests biliary atresia.

2. Picture of cholestasis (consequences):

- Jaundice.
- Fat malabsorption → steatorrhea (bulky offensive stool) & manifestations of fat-soluble vitamins deficiency (K → bleeding tendency, D→ rickets, ...).
- Clay colored stool.
- Retention & regurgitation of bile acids → pruritus & bradycardia.

3. Manifestations of specific cause:

- Marked hepatomegaly with adequate growth → EHBA.
- Low birth weight, microcephaly, rash and hepatosplenomegaly → congenital infection.
- Allagile syndrome features.
- Cataract → congenital rubella infection and galactosemia.

"Fundus examination is part of routine examination in cholestasis"

4. Manifestations of progressive liver damage & cirrhosis in long standing cases:

- Portal hypertension (ascites, hematemesis & splenomegaly).
- Liver cell failure (bleeding tendency, encephalopathy, ...).
- Failure to thrive.

C. Investigations:

1. Investigations to prove cholestasis:

- Increased total and direct bilirubin (direct bilirubin ≥ total bilirubin).
- Elevated liver enzymes (ALT & AST).
- Elevated alkaline phosphatase and gamma-glutamyl transpeptidase (GGT is normal in PFIC and bile acid synthesis defect).

2. *Investigations to determine the cause:*
    a. *Search for treatable cause:*
        - Galactosemia: reducing substance in urine or G1PUT (galactose-1-phosphate uridyl transferase) assay in blood.
        - Septicemia and other bacterial infections: CBC, CRP, ESR & cultures (e.g. urine analysis and culture in UTI).
    b. *TORCH screening:*
        - Total IgM antibodies: if > 20 mg/dl.
        - Specific IgM antibodies of TORCH infections.
    c. *Search for other metabolic conditions:*
        - Alpha-1 anti-trypsin deficiency: low enzyme level.
        - Tyrosinemia: succinyl-acetone in urine.
        - Niemann-Pick disease: bone marrow examination and specific enzyme assay.
    d. *Exclude choledochal cyst:*
        - By abdominal ultrasound.
    e. *Differentiate between idiopathic hepatitis and extrahepatic biliary atresia:*
    – *HIDA scan "Hepatobiliary Imino Di-acetic acid scan":*
        - In EHBA: dye won't reach the intestine.
        - In idiopathic hepatitis: excretion of the dye in the intestine may occur.
    – *Percutaneous liver biopsy (most reliable):*
        - In EHBA: expansion of portal areas with fibrosis and bile duct proliferation.
        - In idiopathic hepatitis: giant cell transformation and degeneration of hepatocytes with inflammatory cells infiltrating portal areas.

➔ *Management:*

A. *Replacement therapy:*
    - Fat soluble vitamins.
    - Fat in the form of medium-chain triglycerides.
    - Predigested formula.

B. *Specific treatment:*
    - <u>Kasai operation (hepatic porto-enterostomy) for EHBA:</u>
        – Best results before the age of 2 months.
        – Post-operative complication: cholangitis.
    - Sepsis: antibiotics.
    - Galactosemia: lactose-free milk.
    - Surgical removal of choledochal cyst.

C. *Symptomatic treatment:*
    - Pruritus: bile acid binders as cholestyramine.
    - Varices: injection sclerotherapy.
    - Hepatic encephalopathy: 10% glucose infusion, enema and oral neomycin.

D. *Liver transplantation in end-stage liver disease:*
    - EHBA is the most common indication in infancy.

E. *Liver supportive measures:*
    - See portal hypertension.

5. Enumerate the causes of portal hypertension, mention its clinical picture, investigations and treatment.

Describe the clinical consequences of portal hypertension.

➔ *Definition:*

Portal venous pressure exceeds 12 mmHg (Normal: 5-10 mmHg).

➔ *Causes:*

1. *Pre-hepatic (causes in portal or splenic veins):*
   a. Portal vein thrombosis or splenic vein thrombosis; due to umbilical sepsis or umbilical vein catheterization.
   b. Congenital portal vein obstruction.
2. *Hepatic:*
   i. *Pre-sinusoidal (causes in portal tracts):*
      a. Congenital hepatic fibrosis.
      b. Bilharzial peri-portal fibrosis.
   ii. *Sinusoidal:*
      a. Causes of liver cirrhosis (mention all, discussed later) as chronic hepatitis, biliary atresia & celiac disease.
      b. Causes of neonatal cholestasis (see before & discuss), except benign recurrent intrahepatic cholestasis & idiopathic hepatitis.
   iii. *Post-sinusoidal:*

   Central vein thrombosis as in veno-occlusive disease (*maybe considered post-hepatic*).
3. *Post-hepatic:*
   a. Hepatic vein thrombosis (Budd-Chiari syndrome).
   b. Constrictive pericarditis.

➔ *Pathophysiology (consequences):*

- **Development of collaterals** (porto-systemic shunts) carrying blood from portal venous system to systemic circulation.
- Bleeding occurs from submucosal collaterals only (esophageal varices → hematemesis) (rectum → hemorrhoids & bleeding per rectum). But never from caput medusa (subcutaneous).

➔ *Clinical presentation:*

1. *Hematemesis:*
   a. Bleeding from esophageal varices (of varying severity).
   b. The most common & maybe the 1st presenting symptom.
2. *Abdominal examination:*
   a. Dilated tortuous anterior abdominal wall veins (caput medusae).
   b. Ascites:
      – Becomes evident in advanced cases (hypoproteinemia + salt & water retention).
      – Occurs early in post-sinusoidal causes.
3. *Organomegaly:*
   a. Pre-hepatic:
      – **Early evident** splenomegaly.
      – Hypersplenism may occur resulting in thrombocytopenia or pancytopenia.
      – Normal liver.

b. Hepatic:
   - Mild to moderate splenomegaly (**early and evident**)
   - Hypersplenism may occur.
   - Enlarged or shrunken liver according to the cause.

c. Post-hepatic:
   - Marked hepatomegaly.
   - Normal spleen.

➔ *Investigations:*

1. *Upper GI endoscopy:*
   Detects esophageal varices.
2. *Abdominal ultrasonography & Doppler:*
   a. Direction of flow in portal system.
   b. Patency of portal vein.
   c. Presence of porto-systemic collaterals.
3. *CT angiography & MR venography:*
   Show vessel patency.
4. *Liver function test.*
5. *Investigations of the cause:*
   a. Hepatitis markers.
   b. Auto-immune screening.
   c. Total metabolic screening (TMS).
   d. Sweat chloride test (cystic fibrosis).
   e. Liver biopsy.

NB: discuss as in investigations of chronic hepatitis & cirrhosis.

➔ *Prevention and management of variceal hemorrhage:*

1. *Management of variceal hemorrhage:*
   A. *Emergency therapy:*
      - Hospitalization.
      - Anti-shock measures: IV fluids & blood transfusion.
      - Correction of coagulopathy: IV vitamin K, fresh frozen plasma, platelets transfusion.
      - Nasogastric tube placement.
      - H_2 receptor blocker (ranitidine) IV: to decrease risk of bleeding from gastric erosions.
      - Vasopressin infusion if bleeding persists.

   B. *Emergency endoscopy:*
      - And either injection sclerotherapy or band ligation (better), if hemo-dynamically stable.

   C. *Emergency shunt:*
      - Surgical porto-systemic shunt or **T**rans-jugular **I**ntra-hepatic **P**orto-**S**ystemic **S**hunt (TIPSS).

2. *Prevention of bleeding from varices:*
   A. *Prevention of 1st episode of bleeding:*
      - Avoid Aspirin & non-steroidal anti-inflammatory drugs (NSAIDs).
      - Beta blockers (Propranolol) to lower pressure in portal area.

- Prophylactic sclerotherapy or band ligation.

B. Prevention of re-bleeding:

- Beta blockers (Propranolol) to lower pressure in portal area.
- Endoscopic sclerotherapy or band ligation.
- Surgical porto-systemic shunts.
- Liver supportive measures:
  - ❖ Nutritional support:
    - Vitamins, minerals & carbohydrate rich diet.
    - Fat in the form of medium-chain triglycerides.
  - ❖ Pruritus:

    Bile acid binders (cholestyramine).
  - ❖ Ascites:
    - Sodium & fluid restriction and diuretics.
    - Albumin infusion or paracentesis in refractory ascites.
  - ❖ Encephalopathy:
    - Treat precipitating factor as GIT bleeding or infection.
    - Protein restriction.
    - Lactulose to reduce ammonia absorption.
    - Neomycin.
- Liver transplantation in end stage liver disease.

---

6. Liver cirrhosis.

➔ *Definition:*

Irreversible damage of liver architecture with fibrosis and formation of regeneration nodules.

➔ *Causes:*

1. Chronic hepatitis causes (discuss).
2. Biliary cirrhosis causes (write all causes of neonatal cholestasis, except benign recurrent intrahepatic cholestasis and idiopathic hepatitis).
3. Congestive:
   a. Budd-Chiari syndrome.
   b. Constrictive pericarditis.
   c. Right-sided heart failure.

Investigations = investigations of causes & complications (as portal hypertension & assessment of liver functions).

---

7. Management of a child with liver disease.

Answer should include management of all diseases discussed in the chapter (Acute & chronic hepatitis, Cirrhosis, Portal hypertension, ..).

OTHER TOPICS:

1. Wilson's disease (discuss in chronic hepatitis + important in oral exams).

➔ *Definition:*

- Autosomal recessive disorder.
- Characterized by decreased synthesis of ceruloplasmin (copper-binding protein), leading to accumulation of copper in liver, brain, kidney and cornea.

➔ *Manifestations:*

1. *Hepatic manifestations:*
   - Rarely present in children under the age of 3 years (usually in children less than 12 years).
   - May present with any form of liver disease: acute hepatitis, fulminant hepatitis, chronic hepatitis, cirrhosis and portal hypertension.
2. *Extra-hepatic manifestations (common):*
   - Neurological manifestations (in the 2nd decade): as extrapyramidal signs (chorea due to affection of basal ganglia).
   - Hemolytic anemia.
   - Kayser-Fleischer ring detected in cornea during slit-lamp examination.

➔ *Investigations:*

- Low serum ceruloplasmin.
- Excess urine copper.

➔ *Treatment:*

- D-penicillamine (copper-chelating agent which promotes copper excretion in urine).

---

2. Causes of hepatomegaly.

1. *Storage:*
   a. Fat: malnutrition, obesity, cystic fibrosis, metabolic liver disease.
   b. Lipid storage disease: Niemann pick or Gaucher disease.
   c. Glycogen: glycogen storage disease or infant of diabetic mother.
   d. Others: as alpha-1 antitrypsin deficiency, Wilson's disease, Schistosomiasis.
2. *Inflammation:*
   a. Acute or chronic viral hepatitis.
   b. Autoimmune hepatitis.
   c. Liver abscess.
3. *Infiltration:*
   a. Cystic: choledochal cyst.
   b. Malignant: hepatoblastoma or hepatocellular carcinoma.
   c. Metastases: neuroblastoma, histiocytosis, lymphoma, leukemia.
4. *Increased size of vascular spaces:*
   a. Budd-Chiari syndrome.
   b. Hepatic veno-occlusive disease (VOD).
   c. Right sided heart failure.
   d. Constrictive pericarditis.

e. Restrictive cardiomyopathy.

5. *Increased size of biliary spaces:*
   a. Biliary obstruction: atresia.
   b. Congenital hepatic fibrosis.

IMPORTANT NOTES:

1. Most common type of acute hepatitis in children → Icteric hepatitis.
2. Most common cause of Neonatal cholestasis → Idiopathic Neonatal hepatitis (Giant cell hep.)
3. 2nd most common cause of Neonatal cholestasis → Extrahepatic biliary atresia.
4. Kasai operation → Hepatic portoenterostomy for Extrahepatic biliary atresia.
5. Most common and earliest feature of portal hypertension → Hematemesis.
6. Wilson disease → decreased synthesis of ceruloplasmin & defective excretion of copper in bile.

Nephrology

ESSAY QUESTIONS: (EXAMS)

1. Describe the diagnostic criteria for active nephrotic syndrome?

→ *Clinical features:*

- Following upper respiratory tract infection
- Generalized pitting edema:
  - It is the main finding, it starts as swollen eyelids (puffiness)
  - It occurs more in the morning, then at the end of the day it occurs in the limbs.
  - The edema progress to lower limb edema, also scrotal or vulval edema is characteristic.
  - Edema of abdominal wall or sacral edema may occur, also pleural effusion and ascites may develop in advanced cases
- Blood pressure is not normal, usually hypotension but sometimes hypertension may occur
- Hematuria is not significant
- GIT congestion cause anorexia and vomiting

→ *Investigations:*

1. Urine analysis: by collection of 24h urine:
   - Proteins above 1 g/m^2/24 hours (normal < 150 mg/24) → proteinuria.
   - Urine protein /creatinine > 2 is diagnostic (normal is < 0.3).
   - Proteinuria is selective (for low molecular weight protein as albumin).
2. Serum proteins are low, and albumin below 2.5g/dl.
3. High serum cholesterol and triglycerides and lipoproteins; cholesterol is above 300 mg/dl.
4. In minimal change type; blood urea and serum creatinine, and serum complement is normal.
5. If there is high possibility of non-minimal change nephrotic syndrome; Renal biopsy is done.

---

2. List complications of minimal lesion nephrotic syndrome.?

1. Hypovolemic shock due to severe oedema, it is clinically presented by abdominal pain and fainting, hypotension and oliguria. The treatment is urgent IV albumin.
2. Pleural effusion and pulmonary, it is clinically presented by respiratory distress, and is treated by slow IV albumin.
3. Arterial thrombosis; This is due to:
   - Loss of antithrombin.
   - Increased synthesis of clotting factors.
   - Increased blood viscosity.
   - Steroid therapy.
4. Infections: by capsulated bacteria "as pseudomonas, pneumococci, Haemophilis infleunza" it is due to:

- Loss of immunoglobulin.
- Loss of opsonizing factors.
- Edema.
- Steroids.

5. Growth failure if on prolonged steroid therapy.

---

3. List indications of renal biopsy in a case of nephrotic syndrome??

(Non-MCNS)

1. Hypertension.
2. Poor response to steroid (steroid resistant or steroid relapse)
3. Age above 8 years
4. Hematuria
5. Complement consumption
6. Non-selective proteinuria
7. Impaired renal function

---

4. Describe the clinical presentation of post streptococcal glomerulonephritis?

- Past history of pharyngitis or scarlet fever 1-3 weeks ago
- Hematuria:
  - May be gross visible to the naked eye (dark tea – colored urine)
  - Microscopic; detected only by dipstick or by microscopic examination of urine.
- Edema: usually mild and tends to collect around the eyes and on dorsum of the feet.
- Hypertension: may cause complications such as Encephalopathy and heart failure.
- Renal insufficiency: oliguria or anuria in severe cases (discuss C/P of acute renal failure).
- The condition may be non- classic or subclinical in 30%.

---

5. Define acute post streptococcal glomerulonephritis, mention its clinical picture, investigation and treatment?

- *Definition*

Autoimmune disease following upper respiratory or skin infections with group A-Beta-hemolytic streptococci (nephrogenic strain)

- latent period 10 days after respiratory infections.
- latent period 21 days after skin infection s.

It is an auto immunologically- mediated disease:
Localization of circulating antigen – antibody immune complexes, or interaction of antibody with local antigen in situ.

- *Clinical presentation*

Past history of pharyngitis or scarlet fever 1-3 weeks ago

- **Hematuria**:
  may be gross visible to the naked eye (dark tea – coloured urine)
  microscopic; detected only by dipstick or by microscopic examination of urine.
- **Edema**: usually mild and tends to collect around the eyes and on dorsum of the feet.
- **Hypertension**: may cause complications such as Encephalopathy and heart failure.

- **Renal insufficiency**: oliguria or anuria in severe cases.
- The condition may be non- classic or subclinical in 30%.

- *Investigation:*
  - Urine analysis; hematuria with red blood cell cast and granular casts and mild proteinuria.
  - Low serum complementsC3 (highly suggestive of post- streptococcal)
  - Elevated Anti- streptococcal antibodies (ASOT)
  - Some strains do not produce ASOT; do antihyaluronidase, antistreptokinase
  - Skin or throat culture
  - If there is Renal impairment: elevated urea, creatinine, potassium, phosphors or metabolic acidosis.
- *Treatment:*

1. Diet
   - Restricted protein intake &high carbohydrate
   - Restricted salt, potassium and phosphorus intake
   - Restrict fluids: fluid balance (intake= urine +insensible water loss)

2. Drugs
   - Eradication of infection (10 days course of penicillin)
   - Control of hyper tension by oral captopril.
   - Treatment of complication:
     - Treatment of hypertension encephalopathy by IV vasodilators
     - Treatment of heart failure by dopamine
     - Treatment of renal failure: peritoneal dialysis.

---

6. Mention the diagnostic work up of a case of UTI?
What are the investigation of recurrent UTI?

I. Urine analysis:

polyuria means WBCs > 5/ HPT. pyuria is unreliable

- false positive in: dehydration –stones – febrile child – vulvovaginitis
- false negative (may lyses during storage)

II. Urine culture:

1. Methods of collection:
   - Midstream
   - Urine collection bag (high liability for infection)
   - Urinary catheter
   - Supra pubic aspirate (most sterile)

2. When it is positive for UTI:
   Colony count > 100000 is diagnostic
   Any colony count in suprapubic aspirate is diagnostic

III. Investigation for recurrent UTI:

- Abdominal US
- Abdominal X- ray
- DMSA (renal isotope scanning)
- Voiding cytourethrogram

- Ct scan
- Cystoscopy
- Assess the renal function
- Intravenous pyelography is not preferred (invasive – high radiation hazard)

---

7. Mention the clinical presentation of UTI in infancy & children?

- ***New born:***
  - Sepsis (jaundice, vomiting, diminished feeding)
  - Fever
  - Screaming during micturition
  - Failure to thrive
- ***Child:***
  - Manifestation of cystitis differs from pyelonephritis
  - Upper urinary tract infections:
    - Acute: fever, rigors& lion pain.
    - Chronic: prolonged fever
    - Turbid urine or hematuria
  - Lower urinary tract infection;
    - Dysuria, frequency, urgency and dribbling and foul-smelling urine.
    - 2ry nocturnal enuresis.
    - Turbid urine or hematuria.

---

8. Mention the causes and clinical presentation of chronic RF?

- *Causes:*

In infancy:

A. Genetic:
   1- Nephronophthisis:
   Acute renal disease with failure of concentration # in medulla leading to:
   water reabsorption from collecting tubules→ dilatation → multiple cysts → renal failure
   2- Polycystic kidney:
   Autosomal recessive disorder which lead to renal failure at age of 4-5 years

B. Developmental:
   Renal aplasia - hypoplasia – dysplasia – obstructive uropathy

In children:

1- Nephritis syndrome: primarily – 2^{ry} – familial
2- Non-minimal change nephrotic syndrome
3- Neglected cases of pyelonephritis

- *Clinical presentation:*

(C\P of loss of kidney function):

1. Mild cases are frequently asymptomatic
2. Urination:
   - 1st: Polyuria and polydipsia (early stage)
   - 2nd: Normal urination (decrease)
   - 3rd: Oliguria then anuria (last stage)

3. Early:
   Hypertension in irritation pathology due to increase RAS → hypertension
   Late:
   Hypertension due to loss of all nephrons (salt and water retention)
4. Poor nutritional intake and lethargy, nausea and vomiting
   due to increase urea and creatinine:
   - Central stimulation of vomiting center
   - Local irritation in GIT
5. Bony abnormalities due to osteodystrophy:
   - Decrease vitamin D activation
   - Acidosis
6. Short stature due to bone deformity and decrease ILGF 1 which is responsible for bone growth
7. Pallor (anemia) due to decrease erythropoietin
8. Bleeding tendency due to:
   - Urea = platelets dysfunction
   - Decrease thrombopoietin
9. Associated with infection (Decrease immunity as urea suppress immune system)

Functions of kidney	*RF*
1- Water excretion 2- Na^+ excretion 3- Urea excretion 4- Erythropoietin formation 5- Thrombopoietin formation	1-Polyuria then anuria 2- Hypertension 3- Azotemia 4- Anemia 5- Bleeding tendency 6- ILGF 1 → Bone deformity and short stature 7. Azotemia: - Decrease immunity - poor nutritional intake

---

9. How to diagnose chronic renal failure?

(Clinical picture + Investigations)

- *Clinical picture*
  1- Mild cases → asymptomatic
  2- Polyuria + polydipsia
  3- Hypertension
  4- bleeding tendency
  5- Pallor (anemia)
  6- Short stature
  7- Poor nutritional status, lethargy, nausea & vomiting
  8- Bony abnormality from renal bony dystrophy
  9- Associated infections due to reduced immunity

- *Investigation for (Diagnosis & Causes)*

A. Investigation for CKD diagnosis

1. Urine analysis. (poor urine concentration ability)
2. Serum analysis (biochemical) / -calcium, +phosphorus, + sodium, + potassium and blood PH (acidosis)
3. Complete blood count (anemia)
4. Abdominal ultrasound. Kidney is …… small with poor …… concentration.

B. Diagnosis for the causes.

1. Urine analysis /according to the cause/ proteinuria.etc.
2. Serum analysis / C3 – C ٤–Antinuclear antibodies as (SIE).
3. Renal biopsy /advanced CKD is small and …….
4. Genetic mutation study (nephronophthiasis is the most common gene mutation in (ESRD).

+ Discuss when to suspect CKD

---

10. How to manage chronic renal failure?

Management= diagnosis + TTT

Diagnosis= clinical picture + investigation (diagnosis of CKD + causes)

(explained in previous question)

TTT of CKD= aims – conservative TTT+ RRT

- *Aims of management of CKD*

1- Slow clinical progression
2- Prevent biochemical & hematological derangements
3- Maintain normal growth & development
4- Preserve the limb vasculation as veins needed in fistula
5- Screen at risk family members

- *Conservation TTT in early stage of CKD:*
  1- Reduce blood pressure
  2- Reduce proteinemia by use of ACEI
  3- Reduce blood lipid levels
  4- Anemia → erythropoietin & iron supplementation
  5- Acidosis → bicarbonate supplementation
  6- Bony dystrophy → calcium &vit. D supplementation
  7- Phosphate retention→(dietary+ phosph. binding agent)
  8- Short stature → growth hormone + balanced adequate diet
  9- Avoid hyperkalemia → reduce K^+ intake in fruits
- *Stage 5 CDK / renal replacement therapy (RRT)*
  1- Long term peritoneal dialysis in young infants
  2- Hemodialysis
  3- Both are used till a renal transplantation is available
- *Prognosis*
  - *Decrease life expectancy*
  - *Increase risk of premature death from cardiovascular disease*

11. Mention Etiology and metabolic abnormalities of acute renal failure "2013"?

➔ *Etiology*

- *Pre-renal*
  1- Blood as amount - blood flow as in hypovolemia" diabetes insipidus "
  2- BP (hypotension) as in shock
  3- As function: hypoxia
- *Renal*

A. Blood related:
   1- -Hypoxia > 6 hr
   2- Renal vein thrombosis (stagnation &hypoxia)

B. Inflammation:
   1- Acute glomerulonephritis
   2- -Severe pyelonephritis
   3- -HUS
   4- Agents damaging kidney (RAIN =MET, METALES)
      a) Radioactive contrast media
      b) Antibiotics
      c) Immunosuppressive
      d) NSAID
      e) Heavy metals

- *Post-renal*
  1- Urinary tract obstruction
  2- UTI
  3- Abnormalities

➔ *Metabolic abnormalities*

NB: to know the abnormalities of metabolism you must know normal renal activity "mentioned later"

- Acidosis, breathing
- Arrhythmia due to serum k+ abnormalities
- ↑ urea
- ↑ creatinine
- NA+ level ↓ or ↑

---

12. Enumerate the causes of acute renal failure and discuss(HUS)syndrome

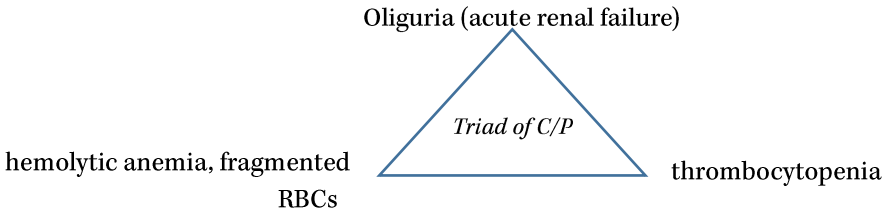
➔ *Aetiology*

See before

➔ **HUS**

Important cause of acute renal failure in children

➔ *Clinical picture:*



Categories

Typical	Atypical	Secondary
Diarrhoea	No diarrhoea	
Due to E. coli	Due to inherited complement abnormalities	Drugs Cancer Post transplantation

Normal renal function ➔ source by Dr. Abo Al-Asrar

شكلها معقد بس واحده واحده اقراها هتلاقيها سهله الدكتور في تفريغاته شارحها بالتفصيل اكتر عشان لو تهت

➔ *Endocrine function:*

1- Erythropoietin→ chronic damage mainly → anemia
2- Thrombopoietin → chronic damage mainly → thrombocytopenia
3- Vit. D activation → chronic damage mainly → rickets
4- Renin → irritation→↑= HTN

→ Destruction→↓ = hypotension

➔ *Excretory action*

- Macro toxins →heavy amount in body to give toxicity
- Micro toxins → low amount in body to give toxicity

Macro:

Urea escapes through secretion

- Saliva: bad taste then bud destruction
- Stomach: hematemesis / melena ' severe gastritis', irritation and heart burn
- Intestine: uremic dysentery
- Sweat: H_2 stimulation→ itching, urea frost if sweat evaporates
- Bronchi → irritation → cough & hemoptysis & wheezes

Then if not enough, serum level increases

Causes serosal irritation

↓CO x = thrombocytopenia

RBC membrane deposition = hemolysis

↓lipase → increase cholesterol

↓cholesterol formation activity = decrease arousal

↓ CTZ = vomit

- ↑ organic acid
  rickets = loss of HCO_3^- of bone as buffer to blood → called melting of bone
- ↑ K
  ↑ HR (SA node irritation)
  ↑ GIT mobility
- ↑ phosphate (عدو الCa^{+2})
  loss of Ca+2--------↑P again-------->> reflex ↑ Pth hormone → no Pth receptor on kidney due to dysfunction → loss of Ca+2 → .....
  a type of rickets called osteitis fibrosis cystica

Micro toxins

- Phenols → A.H.C irritation = hiccup
- Melanin degradation → urochrome pigment → ↓in urine = clear
  → ↑ in serum = skin deposition

- Aluminum → CNS affection → affects memory
  → BM deposition → pancytopenia

---

13. Discuss management of oliguria:

1- Volume expansion:

- **Indication**: in all cases except those with frank fluid overload.
- **Fluid**: Ringer's lactate 20ml/kg over 20-30 minutes.

2- Diuretic therapy:

- **Indication:** when there is fluid overload- no respond to volume expansion.
- Furosemide: 2mg/kg LV then if no response 10mg/kg.
- IV mannitol 20%: 5ml/kg IV drip over 30 minutes.

3- Dopamine infusion:

- Indication in all patients except dehydrated ones.
- Dose: 3-5ug/kg/minute.

4- Fluid restriction:

- Indicated: if no adequate urine flow in spite of the previous 3 measures.
- Total daily fluid intake=insensible water loss (400ml/sqM/24hours) +Urine output+ ongoing losses e,g: vomitus.

5- Management of hyperkalemia:

- Stop all sources of K intake: IV fluids, drugs & food should be K free.
- Cardiac protection: calcium gluconate 10%: 0.5ml/kg slow IV (10min).
- Push K intracellular by: glucose/insulin infusion
  - NaHCO3 5%:4ml/kg IV over 10 minutes.
- Remove k from the body by peritoneal dialysis.

+ Discuss management of AKI

---

14. Mention the causes of Nocturnal enuresis:

Primary causes:

1. Delay in maturation of bladder control has been postponed.
2. Genetic component: a family history is found in most children.
3. Children show deeper sleep and difficulties in waking
4. Loss of the normal nocturnal rise in anti-diuretics hormone (ADH) production.

Secondary causes:

1. DM
2. Diabetes insipidus
3. UTI
4. Stones

OTHER TOPICS:

Treatment of Nocturnal enuresis:

1- Attempt to treat children less than 7 years of age are unsuccessful.
2- 10-15% will cure spontaneously each year with no treatment (high rate).
3- General measures:
   - Advice on fluid intake, diet and toileting behavior:
     - Maintain adequate, but not excessive daytime fluid intake.
     - Reduce evening fluid intake.
     - Avoid caffeine-based drinks.
     - Pass urine regularly during the daytime and before sleep.
   - Reward systems:
     - Rewards should be given for agreed behavior.
     - "Star Chart" for dry nights have shown to be successful.
   - Alarm System:
     - Indicated if there is no response to previous advice.
     - Around 50% of children achieve long-term dryness.
   - Drug Therapy:
     Desmopressin: of choice.

IMPORTANT NOTES:

1- Puffy eyelids → 1st site for edema in minimal change nephrotic syndrome
2- Selective proteinuria → albumin only in urine (nephrotic syndrome)
3- Most common cause of nephrotic syndrome → minimal change nephrotic syndrome
4- Drug of choice in treatment of UTI → trimethoprim sulphamethoxazole

Neurology

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. **Discuss Seizures:**

➔ *Definition:*

Paroxysmal (attack) of disturbance, CNS in origin, manifest as motor, sensory, autonomic, behaviour abnormality or loss of consciousness

➔ *Types:*

A. *Generalized:*

1. *Tonic-Colonic seizures (Grand-Mal):*

Pre-ictal stage:
starts with aura of abnormal smell, flash of light, heat....

Ictal stage:
Tonic convulsions of all muscles
Respiration ceases
↓
Contractions are less
+/- Salivation/defecation (automaticity)
If remain ≥ 30 min (status epilepticus)

Post-ictal stage:
Sleep for 1 hr.

2. *Absence seizures (Petit-Mal):*
   - No loss of consciousness or falling
   - Rule of ((F)) → female, 5 yrs. Fine prognosis, familial
   - Hyperventilation may be a trigger
   - The patient stops what he is doing for 5-20 sec. then continues what he was doing as if nothing happened
3. *Myoclonic:*
   - **Shock like jerks**
   - May be simple → affect neck → **neck falls forwards**
     severe attack → affect trunk muscles, the patient is **thrown** forward or backwards
4. *Atonic:*
   - Rare type
   - The baby falls to the ground
5. *Infantile spasms:*
   - 3-5 months of age
   - Occurs in clusters of yawn-like movement lasting for 15-30 min
   - EEG shows hyps-arrhythmia (abnormal interictal pattern, consisting of high amplitude and irregular waves and spikes in a background of chaotic and disorganized activity seen on electroencephalogram) ((Wikipedia's definition))

B. Partial:

	Simple partial	*Complex partial*
Pre-ictal	No pre-ictal	Aura may be present
Ictal	Retained consciousness	Impaired consciousness usually without falling
	No automatism	Automatism develops (chewing, sucking or swallowing movement)

N.B.: both may become generalized tonic-colonic

Febrile convulsions:

➔ *Incidence:*

- 9 months → 5 yrs.
- +ve family history
- Evident extracranial infection

➔ *Types:*

Nature of the fit:	*Benign (simple) febrile convulsions (80%)*	*Complex febrile convulsions*
1. Pattern 2. Duration 3. Course	- Generalized tonic clonic - 5-15 mins - usually 1 convulsive fit - short postictal stupor	- may be focal - it may persist > 15 mins - Recurrent during same illness - prolonged postictal
4. Family history 5. Development	- Febrile convulsions - normal	- of epilepsy may be present - +/- neurological abnormalities

+ Incidence, TTT & prognosis

---

2. Enumerate causes of meningitis in pediatric age groups, mention its diagnosis and management.

➔ *Causes:*

1. *Bacterial:*
   - *A. From neonatal period → 2 months:*
     - Group B streptococcus.
     - Gram –ve bacilli.
     - Listeria.
     - H. influenzae.
   - *B. From 2 months → 12 years:*
     - H. influenzae.
     - Meningococci.
     - Pneumococci.
2. *Viral:*
   - Enteroviruses (as polio, coxsackievirus, …).
   - Mumps.

3. *Tuberculous meningitis.*
4. *Others:*
    - Rare: mycoplasma, fungal infection.

➔ *Diagnosis:*

A. *Clinical manifestations:*

1. *Systemic manifestations:*
    - Fever, accompanied by tachycardia and hypotension.
    - Myalgia.
    - Arthralgia.
    - Purpura fulminans (vasculitis + thrombosis) or erythematous rash.
2. *Signs of meningeal irritation:*
    - Usually absent below 18 months.
    - Neck pain and rigidity.
    - Brudzinski's sign: If the neck is flexed, hip will be flexed.
    - Kernig's sign: If the hips are flexes 90°, knee extension is limited.
    - Late signs: arched back and photophobia.
3. *Signs and symptoms of increased intracranial tension:*
    - Headache.
    - Vomiting.
    - Bulging anterior fontanel.
    - Abducent paralysis.
    - Hypertension with bradycardia and papilledema (conization).
4. *Disturbed consciousness:*
    - Ranging from irritability → to confusion → to deep coma.
5. *Convulsions.*
6. *Focal neurological signs:*
    - Paresis or paralysis, and spasticity.
7. *Clinical picture of complications:*
    - See next question.

B. *Investigations:*

1. *CSF analysis:*
    - See the table in the next question.
2. *CBC.*
3. *ESR.*
4. *Blood culture.*
5. *Investigations of complications, as:*
    - CT brain: if suspected brain abscess, or edema, and MRI.
    - Na^+ level (serum electrolytes).
    - Leukocytic count, and others.

➔ *Management:*

A. *Prevention:*
- For meningococcal nasopharyngeal carriers and household contacts: oral rifampicin.
- Vaccination: against meningococci, pneumococci & H. influenzae.

B. Treatment:

1. *Parenteral antibiotic therapy:*
   - Initial empirical therapy (before identification of causative organism).
   - It's based on patient's age:
     - Neonates and infants below 2 months: combination of Ampicillin (100 mg/kg) + 3rd generation cephalosporin (as ceftriaxone 200 mg/kg).
     - Infants and children above 2 months: 3rd generation cephalosporin (200 mg/kg/day) is the main therapy. Chloramphenicol maybe added.
   - Duration of therapy:
     - Neonates: 2-3 weeks.
     - Older children: 7-10 days.
2. *Treatment of complications:*
   - For shock: IV fluids.
   - To reduce cerebral edema: fluid restriction.
   - For convulsions: anti-convulsant drugs.
   - If respiratory failure: assisted ventilation.
   - Extensive subdural effusion: subdural taps.
3. *In H. influenzae:*
   - Corticosteroids to reduce gliosis and hearing loss.
4. *For late complications:*
   - Follow up, and periodic monitoring of neurological and developmental status for at least 2 years.

---

3. Differentiate between types of meningitis by CSF examination.

	Normal	**Viral meningitis**	**Bacterial meningitis**	**Tuberculous meningitis**
Appearance	Clear.	Usually clear.	Cloudy.	Opalescent.
Cells/mm³	0-5 lymphocytes.	15-2000 lymphocytes.	10-100,000 polymorphs.	250-500 lymphocytes.
Glucose (mg/dl)	40-80	40-80 (normal)	Low	Very low.
Proteins (mg/dl)	20-40	Normal or mild increase	Increased	Increased

After CSF analysis:

1. If bacterial: culture and sensitivity (CSF, throat).
2. If viral: PCR or serology.
3. If TB: Ziehl-Nielsen stain for CSF – chest x-ray – tuberculin test.

NB: It is contraindicated with:

a. **C**ardiovascular instability.
b. **C**onization.
c. **C**oma.
d. **C**ontamination of site of withdrawal.

NB: Culture maybe –ve if there is previous intake of antibiotics.

---

4. Mention complications (early and late) of bacterial meningitis.

Complications are more common with pneumococcal infection than meningococcal infection.

A. Early complications:

2 brain, 2 hormones, 2 blood

1. Brain abscess (focal signs).
2. Convulsions.
3. Inappropriate ADH release → water intoxication and hyponatremia.
4. Acute adrenal insufficiency → shock.
5. Disseminated intra-vascular coagulation (DIC).
6. Spread of infection and septicaemia → occur during the course of illness.

B. Late complications:

They occur after recovery due to fibrosis.

1. Mental retardation, learning disability, speech defect, visual and auditory handicaps.
2. Epilepsy; due to focal adhesions with underlying cortical irritation.
3. Hydrocephalus → due to inflammatory obstruction of CSF pathway.
4. Subdural empyema and increased intra-cranial pressure.

---

5. Enumerate causes of encephalitis, discuss its diagnosis and management.

➔ *Definition:*

It is diffuse viral infection of brain parenchyma.

➔ *Causes:*

- Herpes simplex (most common): sporadic cases, all year around.
- Arbovirus: cause outbreaks during summer.
- Enteroviruses "coxsackie and ECHO": outbreaks during summer.
- Other viruses as mumps, measles, rubella and varicella-zoster.
- Rare causes: rabies, CMV, and HIV.

➔ *Diagnosis:*

A. Clinical manifestations:

1. Early general features:

- Fever, headache, vomiting and upper respiratory symptoms.

2. Neurological features:

- Coma, convulsions, increased intracranial tension.

B. Complications:

- Mental retardation, learning disability, speech defect, visual and auditory handicaps.
- Epilepsy due to focal adhesions with underlying cortical irritation.

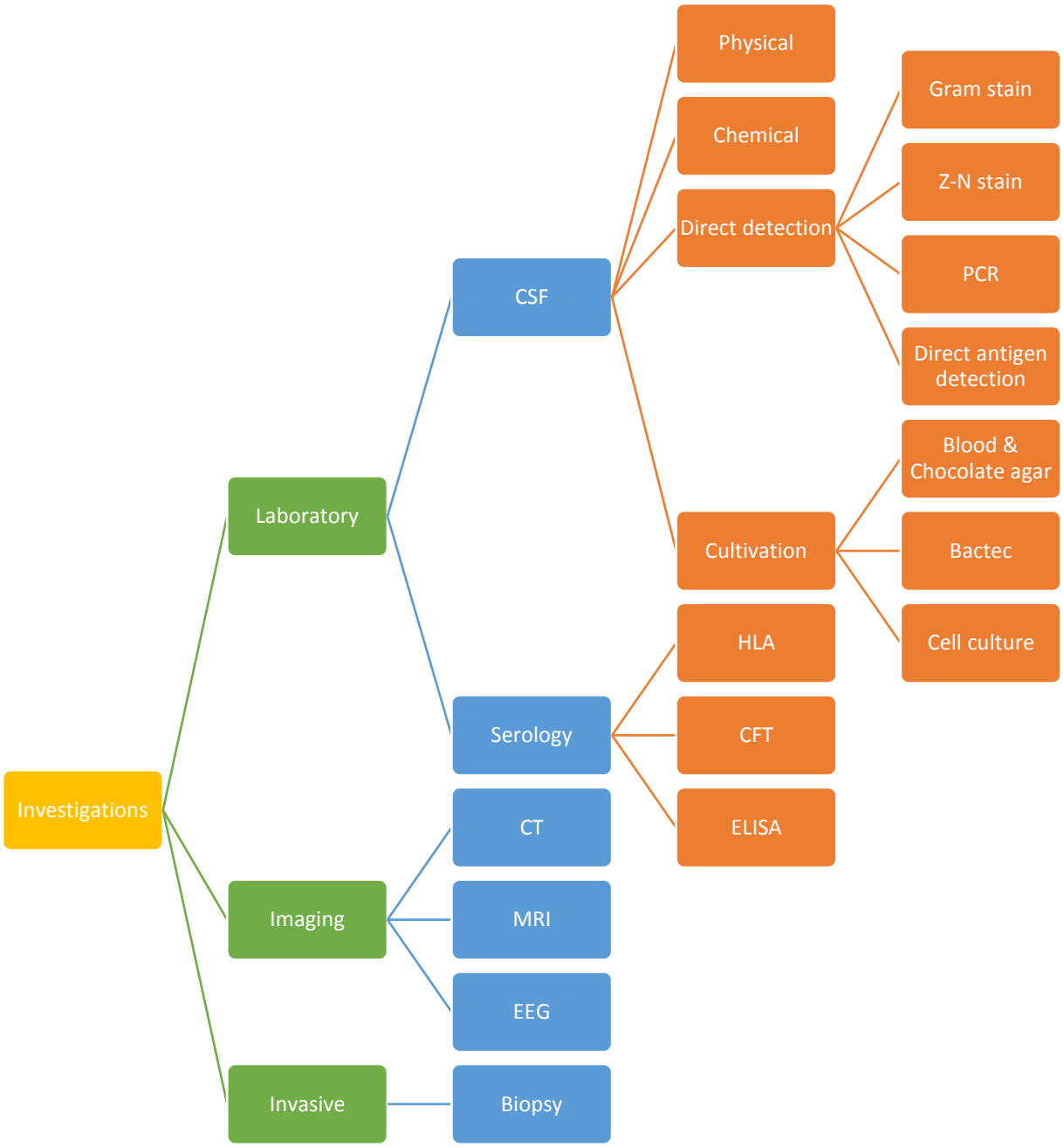
➔ *Diagnostic investigations:*

1. CSF analysis:

- Appearance: usually clear.
- Cells: 15-2000 lymphocytes.
- Normal glucose level.
- Normal to minimal protein increase.
- Fluid is under tension.

2. *CRP, culture & sensitivity and Bactec may be done.*
3. *Brain biopsy:*
    - Best diagnosis for herpes simplex encephalitis.
    - Maybe performed to obtain tissue specimen for rapid viral antigen tests.
4. *Serology:*

    Important to detect viral antibodies, as:
    - Hemagglutination.
    - Complement fixation.
    - ELISA.
5. *EEG, CT scan and MRI:*
    - May reveal focal or generalized anomalies.
6. *EEG:*
    - Diffuse, bilateral slowing of background activity.
7. *MRI:*
    - Helpful in post-infectious encephalitis (foci of demyelination), Herpes simplex has special predilection to temporal lobe (preferentially affects temporal lobe).


Investigations
Laboratory
Imaging
Invasive
CSF
Serology
CT
MRI
EEG
Biopsy
Physical
Chemical
Direct detection
Cultivation
HLA
CFT
ELISA
Gram stain
Z-N stain
PCR
Direct antigen detection
Blood & Chocolate agar
Bactec
Cell culture

➔ *Management:*

A. *Antiviral therapy:*
   - Acyclovir: if herpes simplex or varicella zoster.
   - No specific therapy for other types of encephalitis.

B. *Supportive care (in the ICU):*
   - ABC measures.
   - Care for comatose patients.
   - Prevention and control of convulsions.
   - Reduction of increased ICT.

---

6. State the different clinical types of cerebral palsy. (June, 2012)

➔ *Definition:*
   - Non-progressive, non-fatal, non-curable motor defect (upper motor neuron lesion).
   - May have other manifestations of organic brain damage as seizures, mental retardation, sensory and learning defects with behavioural and emotional disturbance.

➔ *Types:*

1. *Spastic type (70% of cases):*
   - Motor area 4 is affected.
   - Clasp-knife hypertonia.
   - Brisk tendon jerks.
   - Clonus and extensor plantar response.
   - 4 subtypes:
     a. Hemiplegia:
        - One side of body is affected.
        - Usually arm > leg.
     b. Diplegia:
        - 4 limbs.
        - Legs > arms.
     c. Quadriplegia:
        - 4 limbs.
        - Legs = arms.
     d. Monoplegia:
        - One limb.
        - Usually arm.
2. *Atonic cerebral palsy "cerebral infantile hypotonia" (10%):*
   - Both cerebellum and motor area 4 are affected.
   - Severe hypotonia (floppy).
   - ↑↑↑ Tendon reflexes.
3. *Dyskinetic "dystonic/athetoid" cerebral palsy (10%):*
   - Basal ganglia are affected
   - Irregular involuntary movements (some or all muscle groups).
   - Athetosis is the commonest.
   - Maybe chorea or dystonia.

4. *Ataxic cerebral palsy (10%):*
    - Cerebellum is affected
    - Ataxia.
    - Hypotonia.

Spastic (70%)	Atonic (10%)	Dyskinetic (10%)	Ataxic (10%)
Hypertonia "clasp knife".	Severe hypotonia.	Dystonia.	Hypotonia.
Brisk tendon jerks.	Exaggerated tendon reflexes.	Irregular involuntary movements "some or all muscle groups".	Ataxia.
Clonus and extensor plantar response.		Athetosis is the commonest.	

---

7. Discuss Hydrocephalus.

➔ *Definition:*

Dilatation of the ventricular system due to imbalance between production and absorption of CSF.

➔ *Etiology & types:*

1. Communicating:

Congenital:

Arnold chiari

Acquired:

* Post-infection
* Post-hge
* Tumor

2. Obstructive:

Congenital:

* Aqueduct stenosis
* Dandy walker malformation
* Vein of galen

Acquired:

* Post-infection:

Toxoplasma and meningitis

* Post traumatic:

Posterior fossa or intraventricular

* Tumor:

Medulloblastoma

Details:

A. *Obstructive (non-communicating) hydrocephalus:*

Obstruction of CSF flow within the ventricular system.

1. *Congenital:*
    a. Aqueduct stenosis:
    Congenital stenosis "the commonest cause" or acquired (tumors, intracranial

hemorrhage or infection as toxoplasmosis).

b. Dandy-Walker syndrome:

Incomplete formation of cerebellar vermis with obstruction of foramina of Magendie & Luschka → cystic expansion of 4th ventricle + bulging occiput.

c. Malformation of the vein of Galen.

2. *Acquired:*

a. Traumatic: intracranial hemorrhage (posterior fossa subdural hematoma/intraventricular hemorrhage).

b. Inflammatory: post-meningitic gliosis.

c. Neoplastic: posterior fossa tumors as medulloblastoma.

B. Non-obstructive (communicating) hydrocephalus:

- No obstruction in CSF flow within the ventricular system.
- Ventricular dilation occurs due to impaired absorption of CSF in subarachnoid space.

A. Congenital:

Arnold-Chiari malformation:

Pathology:

– Failure of pontine flexure development → downward displacement of pons, medulla & cerebellar vermis into cervical canal → obstruction of subarachnoid space around the brain stem.

– Commonly associated with meningocele or meningomyelocele.

B. Acquired:

1. Traumatic: subarachnoid hemorrhage.
2. Inflammatory: post-menigitic gliosis.
3. Neoplastic: choroid plexus papilloma → overproduction of CSF.

➔ *Clinical picture:*

A. In infancy (before closure of sutures & fontanels):

1. General examination:

a. Head examination:

– Circumference: progressive increase in all skull diameters.

– Scalp skin: thin & shiny (stretched) + loss of hair.

– Scalp veins: prominent.

– Anterior fontanel: widely open.

– Sutures: widely separated.

– Face: globular with prominent forehead.

– Eye: sunset appearance (downward displacement of eyes due to distortion of nerve supply) + squint.

b. Back examination:

– For any swellings (meningocele in Arnold-Chiari syndrome).

2. Neurological examination "in severe cases":

1. Delayed motor & mental development.
2. Motor system:
   – Paralysis with hypertonia & hyper-reflexia (UMNL).
3. Cranial nerves:
   – Optic atrophy in chronic cases.

B. In older children (after closure of sutures & fontanels):

1. Head enlargement is less evident.
2. Neurological:
   - Signs of increased intracranial tension are marked.
   - Spasticity, progressive weakness and ataxia (more in lower limb).

➔ *Investigations:*

1. CT scan (most important):
   Dilatation of ventricular system:
   - In obstructive hydrocephalus: dilation only proximal to site of obstruction.
   - In communicating hydrocephalus: all ventricles are dilated.
2. Hydrocephalus maybe diagnosed on antenatal ultrasound screening.

➔ *Differential diagnosis:*

Causes of macrocephaly (mention, see growth & development chapter).

➔ *Treatment:*

A. Surgical:

1. Treatment of underlying cause (e.g. choroid plexus papillectomy, removal of tumors, ...).
2. Shunt operation:
   a) Ventriculo-peritoneal shunt is the most common.
   b) Complications:
      - Infections: ventriculitis, meningitis & septicemia.
      - Kinking.
      - Obstruction.
      - Separation.
      - As the child grows, replace by a larger one.

B. Medical:

- Acetazolamide in non-progressive causes (diminishes CSF production).
- Not successful alone.

---

8. Discuss Floppy infant.

➔ *Definition:*

Severe persistent hypotonia presenting at birth or in early infancy.

➔ *Etiology:*

A. Central (cerebral) causes:

1. Atonic cerebral palsy.
2. Cortical malformations.

B. Genetic causes:

1. Down syndrome:
   Delayed growth & development and hypotonia.
2. Prader-Willi syndrome:
   Delayed growth & development, obesity, hypotonia & hypogonadism.

C. Peripheral (neuromuscular) causes:

1. Anterior horn cells: spinal muscle atrophy: Werdnig-Hoffmann disease "the most common".

2. Peripheral nerves: hereditary neuropathy.
3. Neuromuscular junction: transient neonatal myasthenia.
4. Muscle diseases: congenital myopathy.

➔ *Clinical manifestations:*

A. *Manifestations of hypotonia:*

1. *Hypotonia of neck muscles:*
   - Head lag: in supine position, if the baby is pulled from his hands, the head lags backward.
2. *Hypotonia of trunk muscles:*
   - Curved trunk on ventral suspension: when the baby is suspended in prone position, he droops downwards.
3. *Hypotonia of limb muscles:*
   - Frog leg position: in supine position, limbs are abducted and flexed.

B. *Manifestations that differentiate central from neuromuscular causes:*
   - In central causes: reflexes are normal or exaggerated.
   - In neuromuscular causes: reflexes are weak or absent.

C. *Manifestations that may suggest the cause:*
   - Discuss in brief clinical picture of cerebral palsy, Werdnig-Hoffmann, Down, Prader-Willli, …. Etc.

---

9. Discuss Werdnig-Hoffmann disease (Spinal muscle atrophy type 1).

➔ *Definition:*

Hereditary progressive degeneration of anterior horn cells due to apoptosis (programmed cell death).

➔ *Mode of inheritance:*

Autosomal recessive (mutation of gene on chromosome 5).

➔ *Incidence:*

Most common cause of floppy infant.

➔ *Clinical picture:*

A. *Intrauterine:*

Diminished fetal movements are often noticed during pregnancy.

B. *At & after birth:*

1. Arthrogryposis (positional deformities of the limbs).
2. All criteria of floppy infant (discuss).
3. Hypotonia + Absent grasp reflex.

C. *Later on:*

1. Motor system:
   - State: muscle wasting, fasciculations (best seen in tongue as worm like movements).
   - Power:
     - Severe weakness.
     - Weakness of respiratory muscles → weak cough & weak cry (pseudo-bulbar palsy).
   - Reflexes: absent.
2. Normal mentality.

3. Normal eye movements.
4. Late respiratory paralysis.
5. Death: from aspiration pneumonia & respiratory failure (mostly in late infancy).

➔ *Investigations:*

1. Electromyography (EMG).
2. Muscle biopsy.
3. Molecular study.

➔ *Treatment:*

1. Pulmonary complications:
   - Treatment of chest infection.
   - Ventilation.
2. Nasogastric feeding maybe needed.
3. Physiotherapy.

---

10. Discuss Causes of acute paralysis in children.

➔ *Definition:*

Rapid loss (within hours or days) of previously acquired motor skills.

➔ *Etiology:*

1. *Spinal cord:*
   - Transverse myelitis.
   - Spinal cord trauma (as in road traffic accidents).
2. *Anterior horn cells:*
   - Poliomyelitis: **asymmetric ascending** paralysis.
3. *Peripheral nerves:*
   - Guillain-Barre syndrome (commonest cause): **symmetric ascending** paralysis.
   - Post-diphtheritic paralysis: **symmetric descending** paralysis.
4. *Neuromuscular:*
   - Botulism: **symmetric descending** paralysis.

NB: Discuss clinical picture of polio & Guillain-Barre.

---

11. Discuss etiology, clinical features & investigation of Acute post strepto-infectious polyneuropathy (GBS)?

Discuss the causes, clinical picture & management of Guillain- barre syndrome?

➔ *Definition*:

- Post-infectious demyelination of the peripheral nerves
- Characterized by acute loss of motor functions within hours or few days
- Due to formation of antibody attaching itself to protein components of myelin.

➔ *Clinical picture:*

- Preceded by GIT infection
- **Ascending symmetrical** weakness with hypotonia and hyporeflexia (LMNL).
  - **it starts** in the lower limbs and ascends within hours or Days to affect the trunk and the upper limbs.
  - may affect **bulbar nerves** (bulbar paralysis): Aspiration.

- **respiratory nerves**: respiratory failure: may need ventilation.
  the patient show paradoxical breathing
- **Gradual complete recovery**: the paralysis usually remains stationary for few weeks followed with gradual complete recovery over few or several weeks.
- in some patients, paralysis may persist for several months.

- **Sensory symptoms** usually in the distal limbs, are like striking than the paresis but can be unpleasant.
- **Autonomic** involvement may occur.

➔ *Investigation:*

- Diagnosis is **mainly clinical**.
- **CSF examination** after 2 weeks of the onset show increased proteins.
- **Electromyography and nerve conduction velocity** is diagnostic of peripheral nerve affection.

➔ *Management*

1- patients with respiratory or bulbar paralysis should be admitted to **ICU** for close observation and possible **mechanical ventilation**.
2- **Intravenous immunoglobulins** is the best choice.
3- **plasmapheresis**.
4- **physiotherapy** from the second week of illness.

OTHER TOPICS:

Mental retardation/Duchenne muscular dystrophy/Brain abscess/...

For details, see department book.

IMPORTANT NOTES:

1- Attack of absence seizures triggered if → child hyperventilates for a minute.
2- Brain biopsy → Best for herpes simplex encephalitis.
3- Most common congenital cause for hydrocephalus → Aqueduct stenosis.
4- For leg, Head lag, curved trunk on prone position → Floppy infant.
5- Most common cause of flappy infant → werding Hoffmann disease.
6- Arthrogryposis → positional deformities of limb at birth (werding Hoffman disease).
7- Best ttt for Guillain Barre syndrome → IV immunoglobin.
8- Gower's sign → Duchenne muscular dystrophy
9- Pes cavus → concave arch of foot (Duchenne dystrophy).
10- Screening test for Duchenne dystrophy → CPK.

Allergy

In any question, write incidence and common causes then write anaphylaxis in details.

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. Discuss treatment of atopic dermatitis (eczema).

➔ *Incidence:*

- Very common skin disease (10% of all infants and children).
- Family history of allergy (50% develop other allergic diseases).
- It is associated with allergic sensitization (raised IgE levels).

➔ *Clinical picture:*

➢ *Onset:*

Any age (but usually in infancy).

➢ *Course:*

- Usually improves with age.
- Some will have the condition into adulthood.
- Itching usually occurs first.
- Then, skin is dry, itchy, red, broken and sore.

1. *Between 2 and 6 months of age:*
    - Itchy, wet to dry, red skin and small bumps on their cheeks, forehead or scalp.
    - Rash may spread to extremities and trunk.
    - Red, crusted or open lesions may appear on any area affected.
    - Circular, slightly raised, itchy and scaly rashes in the bends of elbows, behind knees, or on back of wrists and ankles.
2. *As kids get older:*
    - Rash is less oozy (skin is extremely itchy and dry).
    - Symptoms run in remissions and exacerbations.

N.B.

Infants and children with eczema may have food allergy, esp. cow milk allergy (avoidance is important).

➔ *Treatment:*

A. *Change of life style:*

1-4 ياخد shower:

1. Avoid giving the child frequent hot baths, which tend to dry the skin.
2. Use warm water with mild soaps or non-soap cleansers.
3. Avoid scented soaps.
4. Avoid excessive scrubbing & toweling after bathing.

5-6 يلبس ويتعشى:

5. Avoid harsh or irritating clothes. Use soft clothes that breathe, as cotton.
6. Eliminate any known allergen as certain foods, dust, pet dander.

7-8 يقص ضوافره وينام:

7. Keep child's fingernails short to minimize any skin damage.
8. Wearing comfortable light gloves to bed if scratching at night.

B. Medical treatment:

بعد ما ياخد الshower يحط فازلين علي الوجه والإيدين:

Creams & Lotions.
Cool compresses.
Local steroids.
Oral antihistaminic.
Oral steroids.

1. Apply moisturizing ointments, lotions, creams (after bath and 2-3 times/day).
2. Avoid alcohol-containing lotions or moisturizers (make skin dry).
3. Apply cool compresses (such as wet cool washcloth) on irritated areas.
4. Corticosteroid cream: concentration depends on severity of symptoms.
5. Oral sedative type of antihistaminics if itching is severe (diphenhydramine "Benadryl" is the most effective).
6. Short course of oral steroids as prednisone for control of acute outbreak of eczema.

OTHER TOPICS:

Pediatric allergic disorders include:

1. Asthma (respiratory chapter).
2. Allergic rhinitis.
3. Conjunctivitis.
4. Eczema (atopic dermatitis).
5. Urticaria.
6. Food allergy.
7. Drug allergy.
8. Insect bite allergy.
9. Anaphylaxis (emergency chapter).

➔ *Incidence:*

Common:

- 40% of children develop allergic rhinitis, asthma or eczema.
- 8% food allergy.

➔ *Age of presentation:*

- Infants with strong family history are at higher risk.
- Allergic children develop multiple allergic disorders at different ages (allergic march).
- Eczema and food allergy in infancy.
- Asthma and allergic rhinitis in toddlers (12-36 months) and childhood.

➔ *Prevention:*

Attempts to interrupt allergic march (non effective):

1. Environmental manipulation (avoidance of allergens in pregnancy and lactation).
2. Probiotics (oral microflora).
3. Prebiotics (immunologically active oligosaccharides).
4. Nutritional supplements (as antioxidants, fish oil, trace elements).

1. Food allergy.

➔ *Incidence:*

8%.

➔ *Types:*

1. IgE-mediated or non IgE-mediated (non-immunological reaction to a specific food = non-allergic food hypersensitivity).
2. Food intolerance (less serious and does not involve immune system).

➔ *Causes:*

Vary according to the **agent** and the child's **age**:

- **Infants:** most common causes are milk, eggs and peanuts.
- **Older children**: peanuts, tree nuts and fish.
- **Fruit allergy**: usually mild, with itchy mouth (oral allergy syndrome).
- The reaction is variable from mild to frightening and even life-threatening.

➔ *Clinical picture:*

- Symptoms develop within few minutes to two hours.
- May develop even with tiny amount or at the 1st time.

- No cure (only some tolerance).
- Most common symptoms:
  - Tingling or itching in mouth.
  - Swelling of lips, face, tongue, throat or other parts of the body.
  - Hives, itching or eczema.
  - Wheezing, nasal congestion or trouble breathing.
  - Abdominal pain, diarrhea, nausea, vomiting.
  - Dizziness, lightheadedness or fainting.
  - Anaphylaxis (discuss symptoms as in emergency chapter).
  - Food-associated exercise-induced anaphylaxis:

    A disorder in which exercise is tolerated and food or foods are tolerated, but when exercise follows ingestion of certain food, anaphylaxis occurs.

➔ *Diagnosis:*

1. Suggestive history.
2. Screening tests for allergy:
   a. Skin prick tests.
   b. Measurement of specific IgE antibodies in blood.
      "The greater the response, the more likely the child is to be allergic".
3. Double-blind placebo-controlled food challenge:
   - **Gold standard** investigation.
   - The child is given increasing amounts of food or placebo.

➔ *Management:*

1. Avoidance of the food.
2. Avoidance is difficult for milk and nuts (added to many foods).
3. Written self-management plans and adequate training:
   - Mild reactions: anti-histaminics.
   - Severe reaction or has asthma: epinephrine (adrenaline) IM by auto-injector (as Epipen).

---

2. Insect bite (sting hypersensitivity).

➔ *Causes:*

1. Bee sting.
2. Wasp sting.
3. Fire ant sting.

➔ *Clinical picture:*

1. Mild:

   Local swelling (popular, vesicular or large bullae).
2. Moderate:

   Generalized urticaria.
3. Severe:

   Systemic symptoms with wheezes or shock.

➔ *Management:*

1. Children with previous mild reaction are unlikely to develop severe reaction in the future (reassure his family).

2. Children with previous <u>severe reaction</u> should:
   - Carry adrenaline auto-injector.
   - Be desensitized using specific immunotherapy.

---

3. Urticaria.

➔ *Types:*

1. **<u>Acute urticaria</u>** → exposure to allergen or viral infection.
2. **<u>Chronic urticaria</u>** (> 6 weeks) → usually non-allergic in origin:
   - Results from local increase in capillary permeability.
   - The cause maybe identified (as cow milk allergy), but most are idiopathic.

➔ *Causes:*

1. Idiopathic (common).
2. Infection.
3. Ige-mediated:
   - Specific food as cow milk, nuts (esp. peanuts), fish.
   - Blood products.
   - Drugs as penicillin and cephalosporin.
4. Pharmacological:

   Foods containing histamine-releasing substances as strawberries, egg white, aspirin and other NSAIDs.
5. Physical agents:
   - Heat.
   - Cold.
   - Pressure.

➔ *Clinical picture:*

- Characteristic skin rash with slightly elevated wheels and macules.
- May involve deeper tissues → swelling of lips and eyelids (angioedema).
- May progress to anaphylaxis (discuss clinical picture as in emergency chapter).

---

4. Allergic rhinitis (hay fever).

➔ *Incidence:*

Very common (20% of children).

➔ *Etiology:*

1. <u>Seasonal allergic rhinitis:</u>

   Due to sensitization and exposure to airborne pollens:
   - Tree pollens in spring.
   - Grass pollens in summer.
   - Mould spores in autumn.
2. <u>Perennial allergic rhinitis:</u>

   Due to sensitization and exposure to house dust mites or ongoing exposure to an allergen such as a pet.

➔ *Clinical picture:*

1. Recurrent coryza characterized by **cough-variant rhinitis** due to post-nasal drip.

2. Conjunctivitis with excess watery discharge.
3. Itchy throat.
4. Associations: eczema, asthma, sinusitis and adenoid hypertrophy.

➔ *Treatment:*

1. Antihistaminics (single or in combination).
2. Steroid nasal spray.
3. Cromoglycate eye drops.
4. Leukotriene inhibitors.
5. Oral steroids.
6. Specific immunotherapy.

Rheumatology

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. Mention different lines of management for treatment of juvenile idiopathic arthritis

Juvenile idiopathic (rheumatoid) arthritis "JRA"

Definition:

- Juvenile = **before 16 years of age.**
- Idiopathic arthritis: persistent arthritis > **6 weeks** in **absence of infection or any defined cause** (+ **evidence of autoimmunity**).

Etiology:

Unknown, with genetic susceptibility.

Clinical picture:

- Diagnosis depends on presence of persistent arthritis > 6 weeks in absence of infection ot any defined cause.
- <u>At least 7 different forms with 3 main forms:</u>
  1. *Systemic onset JRA:*
     - **A. <u>General:</u>**
       - Intermittent fever.
       - Macular rash.
     - **B. <u>Local:</u>**
       - **Hepatosplenomegaly.**
       - **Lymphadenopathy.**
     - **C. <u>Joints:</u>**
       - No arthritis at the onset, appears **later.**
     - **D. <u>Labs:</u>**
     - Diagnosis is **clinical.**
     - Leukocytosis, elevated acute phase reactants and **pericardial effusion.**
  2. *Polyarticular (5 joints or more are affected):*
     - **A. <u>Joints:</u>**
       - Pain & limitation of movement of **small** and **large** joints (**symmetrical**).
       - Common sites: large joints of the limbs, cervical spine & TMJ.
     - **B. <u>General:</u>**
       - Systemic features are **minimal.**
  3. *Pauciarticular (oligoarticular) (4 joints or less are affected):*
     - i. *<u>Type 1:</u>*

       Affects **young girls** (the most common).
       - **A. <u>Joints:</u>**
         - **Asymmetrical** affection of **large** limb joints (knee and ankle).
       - **B. <u>Labs:</u>**
         - Positive **ANA.**

C. <u>Prognosis:</u>

– High risk to develop **chronic iridocyclitis** (asymptomatic; needs slit lamp).

ii. *<u>Type 2:</u>*

More in **old boys**.

A. <u>Joints:</u>

– As type 1.

B. <u>Labs:</u>

– High association with **HLAB 27**.

C. <u>Prognosis:</u>

– May progress to juvenile **ankylosing spondylitis.**

Investigations:

1. CBC
2. ANA
3. Slit lamp examination
4. X-ray: erosions
5. Arthrocentesis: To exclude other causes of arthritis

Treatment:

➔ *Aim of the therapy:*

1. reduce inflammation
2. maintain function of the limbs

➔ *Lines of management*

A. Anti-inflammatory drugs:

1. **<u>non- steroidal anti-inflammatory drugs as:</u>** salicylic acid – ibuprofen – ketoprofen - naproxen - diclofenac → the response for this TTT take several weeks
2. **<u>corticosteroids</u>** may be:
   - interarticular → can suppress articular involvement
   - topical in iridocyclitis (as in pauciarticular type)
   - Oral → in systemic disease as in pericarditis

B. Immuno-modulatory drugs; are the TTT of choice now

1. methotrexate
2. Anti-tumor necrosis factor

C. Physiotherapy

D. *Support:*

Psychological and family support

---

2. Enumerate causes of polyarthritis in children

➔ *Definition:*

Pain and swelling of the joint/s leading to limping or reluctance to use the limbs

➔ *Causes:*

1. infectious:

- **<u>bacterial</u>** by pyogenic bacterial as staph, Hemophilus and TB
- **<u>viral</u>** as rubella and mumps

2. post infection:

as Rheumatic fever

- **definition:** autoimmune disorder involving heart, joint, skin and basal ganglion
- poly arthritis occurs in **70%** of cases of RF:
  - it is polyarticular asymmetrical affecting multiple large joints as knees. Elbow. Ankles and wrists
  - it is migratory arthritis from one joint to another (fleeting)
  - it improves spontaneously without residual damage

3. *Reactive arthritis: (very common)*
4. *traumatic*
5. *collagen vascular disease:*
   a. **juvenile rheumatoid arthritis:**
      - itis persistent arthritis (>6 wks.)
      - in absence of infection or any defined cause (+evidence of autoimmunity)
      - it occurs below the age of 16 years.
   b. **systemic lupus erythromatosus:**
      - it is multi-system autoimmunity disease
      - featured by wide spread inflammation of connective tissue and blood vessels
      - it causes non-erosive arthritis
   c. Dermatomyolysis
   d. polyarthritis nodosa
6. *vasculitis*
   - Kawasaki disease
   - Henoch-Schonlein purpura
7. *inflammatory bowel diseases*
   - crohn's disease
   - ulcerative colitis
8. *Hematological:*
   - Hemophilia
   - sickle cell anemia
9. *malignant:*
   - leukemia
   - lymphoma
   - neuroblastoma
10. *Metabolic cystic fibrosis*

OTHER TOPICS:

1. Systemic lupus erythematosus.

Definition:

- **Multisystem autoimmune** disease characterized by widespread **inflammation of blood vessels and connective tissue.**
- If untreated, it results in significant morbidity and mortality.

Diagnosis:

***4** of 13 criteria to establish the diagnosis:*

1. Malar **rash.**
2. Discoid **rash.**
3. **P**hotosensitivity.
4. Oral or mucocutaneous ulcerations.
5. Alopecia.
6. Encephalopathy.
7. **N**ephritis.
8. **N**on erosive arthritis.
9. **P**leuritis or pericarditis.
10. **P**ancytopenia or cytopenia.
11. **P**ositive antinuclear **antibodies.**
12. **Antibodies** to double strand DNA.
13. +ve Coomb's test.

Treatment:

1. *Non steroidal anti-inflammatory drugs.*
2. *Corticosteroids:*
   - Oral prednisone 1-2 mg/kg/day.
   - IV methylprednisolone.
3. *Immunosuppressive agents:*
   - Azathioprine.
   - Cyclophosphamide.
4. *Hydroxychloroquine:*
   a. Adjuvant with steroids.
   b. Controls cutaneous manifestations.

---

2. Septic arthritis.

Incidence:

- Common in children **less than 2 years old**.
- **Knee** is most commonly affected.

Etiology:

1. *Causative organism:*
   - Staphylococcus aureus.
   - H. influenzae.

2. *Route of transmission:*
    - Hematogenous spread.
    - Direct (wound) or spread from adjacent osteomyelitis.

Clinical picture:

1. **Fever**, anorexia, malaise, toxic look.
2. **Red, hot, tender joint** with reduced range of movement (**pseudo-paralysis**).
3. **Joint effusion** maybe detected (usually one joint).
4. Picture of **precipitating factor** (e.g. immunodeficiency).

Investigations:

1. *CBC:*

Leukocytosis.

2. *Acute phase reactants:*

Elevated.

3. *Ultrasound of deep joints:*

May show effusion.

4. *Aspiration of joint space under ultrasound guidance.*

Endocrine

Endocrine is A VERY IMPORTANT CHAPTER (STUDY BY HEART)

ESSAY QUESTIONS: (EXAM QUESTIONS)

1. Enumerate causes and investigations of congenital hypothyroidism (June 2009)

➔ *Definition:*

Congenital hypothyroidism is more serious and affect brain development

➔ *Types:*

Primary & Secondary.

➔ *Causes*:

a. Mal-development and mal-descent (non-goitrous cretinism)
   - Aplasia and agenesis: complete absence of thyroid gland (most common).
   - Dysgenesis: the gland is present but small and underdeveloped.
   - Ectopic.

b. Dyshormonogenesis (goitrous cretinism): inborn error of hormonal synthesis, it is an autosomal recessive.

c. Iodine deficiency: Endemic goitre and endemic cretinism
   - It is present in desert.
   - It is dysgenesis placed anywhere between the root of the tongue and the suprasternal notch.

d. Ingestion of goitrogens: antenatal maternal ingestion of anti-thyroid drugs (thiouracil or radioactive iodine)

➔ *Investigations:*

1) Lab findings:
   - Low serum T4 level (normal range 5-12 Mg/dl)
   - High TSH (normal range 0.5-4 mIU/L)
     - It is **most sensitive** test for primary hypothyroidism.
     - TSH is markedly raised (above 50 mIU/L)
2) Delayed bone age: characteristic for congenital hypothyroidism.
3) Radioactive iodine assay: essential for diagnosis of the cause. (DD between aplasia, ectopic & malfunction).
4) Thyroid US

NB: Neonatal screening program:

- It is implemented in Egypt to prevent mental retardation.
- All new-borns are screened for hypothyroidism between 3rd and 7th day of life.
- A blood drop is obtained by heel prick on a filter paper and analysed for TSH.
- If TSH value is 20 U.U/L, an immediate blood sample is withdrawn and analysed (normal is 5 U/L).
- If data are confirmed, treatment is immediately initiated.

2. State early and late manifestations of congenital hypothyroidism. (June 2010).
List clinical features in an infant that suggest Congenital Hypothyroidism (June 2012)

➔ *At birth (No symptoms):*
Thyroid screening is important to prevent mental retardation.

➔ *Early manifestations: (few weeks)*
- Prolonged gestational period.
- Symptoms:
  - Activity: sluggish with little cry and excess sleep.
  - Prolonged physiological jaundice.
  - Constipation.
  - Feeding difficulties.
- Signs:
  - Anterior fontanel is wide and open posterior fontanel.
  - Slow pulse.
  - Cold skin with oedema and mottling.
  - Abdominal distention and umbilical hernia.

➔ *Late manifestations (months):*
- *Measures*:
  - **Short stature**: long trunk and short legs (due to preserved infantile proportions).
  - Large head.
- *Development*
  - **Delayed motor development** (head support, sitting and standing).
  - **Mental retardation** (delayed smiling, recognition of mother).
  - **Delayed sexual development**.
- *Head and neck "coarse features"*
  - Widely open anterior fontanel.
  - Dry rough hair, low hair line.
  - Short wrinkled forehead.
  - Swollen eyelids.
  - Depressed nasal bridge and noisy breathing.
  - Thick protruded tongue
  - Delayed dentition
  - Short neck
- *Skin:*
  pallor (anaemia), yellow skin (hypercarotenaemia), dry skin.
- *Limbs*:
  short limbs, short broad hand and feet.

---

3. List causes of congenital hypothyroidism: describe its clinical features: June 2011.

➔ *Definition:*
Congenital hypothyroidism is more serious and affect brain development

➔ *Causes*:

a. Mal-development and mal-descent (non-goitrous cretinism)
   - Aplasia and agenesis: complete absence of thyroid gland (most common).

- Dysgenesis: the gland is present but small and underdeveloped.
- Ectopic.

b. Dyshormonogenesis (goitrous cretinism): inborn error of hormonal synthesis, it is an autosomal recessive.

c. Iodine deficiency: Endemic goitre and endemic cretinism
- It is present in desert.
- It is dysgenesis placed anywhere between the root of the tongue and the suprasternal notch.

d. Ingestion of goitrogens: antenatal maternal ingestion of anti-thyroid drugs (thiouracil or radioactive iodine)

➔ *Clinical features:*

A. *At birth (No symptoms):*
Thyroid screening is important to prevent mental retardation.

B. *Early manifestations: (few weeks)*
- Prolonged gestational period.
- Symptoms:
  - Activity: sluggish with little cry and excess sleep.
  - Prolonged physiological jaundice.
  - Constipation.
  - Feeding difficulties.
- Signs:
  - Anterior fontanel is wide and open posterior fontanel.
  - Slow pulse.
  - Cold skin with oedema and mottling.
  - Abdominal distention and umbilical hernia.

C. *Late manifestations (months):*
- *Measures*:
  - **Short stature**: long trunk and short legs (due to preserved infantile proportions).
  - Large head.
- *Development*
  - **Delayed motor development** (head support, sitting and standing).
  - **Mental retardation** (delayed smiling, recognition of mother).
  - **Delayed sexual development**.
- *Head and neck "coarse features"*
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  - Dry rough hair, low hair line.
  - Short wrinkled forehead.
  - Swollen eyelids.
  - Depressed nasal bridge and noisy breathing.
  - Thick protruded tongue
  - Delayed dentition
  - Short neck
- *Skin:*
  pallor (anaemia), yellow skin (hypercarotenaemia), dry skin.

- *Limbs*:
  short limbs, short broad hand and feet.

---

4. Discuss causes and clinical picture of Primary Hyperthyroidism (Sep. 2014)

➔ Causes*:*

1. *Congenital hypothyroidism:*

a. Mal-development and mal-descent *(non-goitrous cretinism)*

- Aplasia and agenesis: complete absence of thyroid gland (most common).
- Dysgenesis: the gland is present but small and underdeveloped.
- Ectopic.

b. *Dyshormonogenesis (goitrous cretinism):*
inborn error of hormonal synthesis, it is an autosomal recessive.

c. *Iodine deficiency:* Endemic goitre and endemic cretinism

- It is present in desert.
- It is dysgenesis placed anywhere between the root of the tongue and the suprasternal notch.

d. *Ingestion of goitrogens:* antenatal maternal ingestion of anti-thyroid drugs (thiouracil or radioactive iodine)

2. *Acquired hypothyroidism*

Hashimoto thyroiditis: Autoimmune disease which may be associated with other autoimmune disorders.

➔ *Clinical features:*

1. Congenital hypothyroidism:

See before.

2. Acquired hypothyroidism:

a. Goiter

b. School underachievement and poor mentality

c. Gradual deceleration of height gain

d. Delayed puberty

---

5. Describe the prevention and treatment of Congenital Hypothyroidism (Sep. 2009)

➔ *Prevention (Neonatal screening program)*

- It is implemented in Egypt to prevent mental retardation
- All newborns are screened for hypothyroidism between 3rd and 7th day of life
- A blood drop is obtained by heel prick on a filter paper and analyzed for TSH
- If TSH >20 U.U/L an immediate blood sample is withdrawn and analyzed
- If data are confirmed, treatment is immediately initiated

➔ *Treatment:*

A. *Lifelong therapy with oral thyroid hormone (L-thyroxin)*

- **At birth:** 10 µg/Kg/day
- **In childhood**: 100 µg/Kg/day

B. *Monitoring*

- Assessment of height /3 months → Normal growth velocity.
- Assessment of bone age /1 year → Match with the chronological age.

- Assessment of mental development by IQ.
- Assessment of puberty.
- Measurement of T4 (high normal) and TSH (low normal)

---

6. Describe lab diagnostic criteria of type I DM. (September, 2010)
Describe clinical picture and diagnostic criteria of type I DM. (2008)

➔ *Lab results diagnostic criteria: (Investigations)*

A. Ordinary case:
- Fasting blood glucose > 126 mg/dL.
- 2 hr. post prandial > 200 mg/dL.
- Random blood glucose > 200 mg/dL + symptoms (clinical picture).

B. Diabetic ketoacidosis presentation "write as in emergency chapter":
- Hyperglycemia (blood glucose > 300 mg/dL).
- Metabolic acidosis (low pH & bicarbonate).
- Glucosuria & ketonuria.

➔ *Clinical picture:*

A. Age of presentation:
- < 1 year: It's uncommon before this age.
- Early school years: more steadily during this age.
- 12-13 years: reach a peak in this age.

B. There are 3 main presentations: (one of 3)
- Polyuria, polydipsia & weight loss (**the most common presentation**).
- 2ry nocturnal enuresis: bed wetting by night if previously trained.
- Diabetic ketoacidosis: some children present for the 1st time with manifestations of diabetic ketoacidosis which include:
  - Early manifestations: fever, vomiting & abdominal pain.
  - Late manifestations: dehydration, metabolic acidosis, shock & coma.

➔ *Complications:*

A. Acute:
a. Hypoglycemia (due to insulin overdose).
b. Diabetic ketoacidosis.
c. Infection (urinary tract infection, vaginal & pedal candidiasis).

B. Chronic:
a. Microangiopathy as in retinopathy, sensory & autonomic neuropathy, and nephropathy.
b. Delayed puberty.
c. Ischemic heart disease.
d. Diabetic foot: foot infection with neuropathy & vasculopathy.
e. Associated autoimmune diseases as celiac disease or autoimmune thyroiditis.

➔ *Differential diagnosis of diabetes. (2007)*

1. Other causes of polyuria: as diabetes insipidus & CRF. (Nephrology).
2. Other causes of enuresis (nephrology chapter).
3. Other causes of acute abdominal pain (GIT).

4. Other causes of dehydration (GIT).
5. Other causes of respiratory distress (Neonatology).
6. Other causes of coma. (Emergency)
7. Other causes of metabolic acidosis. (Emergency)

NB:

أكيد السؤال ده ليه وقت محدد فإحنا مش هنكتب كل الأسباب. إحنا هنكتب الـ٧ سطور دول وناخد واحدة منهم نعملها DD.

For Example: Differential diagnosis of dehydration:

1. Gastroenteritis: isotonic dehydration.
2. DKA, high fever, hot environment, excessive sweating: hypertonic dehydration.
3. Prolonged diarrhea with compensation by drinking water or hypotonic solution: hypotonic dehydration.

Dehydration	*Isotonic*	*Hypertonic*	*Hypotonic*
Skin:	Poor turgor	Fair turgor	Very poor turgor
Eye:	Sunken	Mildly sunken	Very sunken
CNS:	Normal	Irritability & seizures	Lethargy & coma
Tongue:	Normal	Dry	Moist
Serum Na^+:	Normal	> 150	< 130

OTHER TOPICS:

1. **Treatment of a case of type I diabetes mellitus:**

A. *Hospitalization:* any new diabetic child (to make an intensive educational program)

B. *Insulin:*

- **Nature:** recombinant DNA concentration is 100U/ml.
- **Injection by**: Syringe or Pen-like devices or subcutaneous infusion pump.
- **Rout**: subcutaneous tissue of the upper arm, the antero-lateral thigh.
- **Dose:** variable from 0.25 to 1 unit/Kg/day.
- **Types of insulin used in type I DM**:

	Type of insulin	*Action*
Very short	Lispro, Aspart	3 hours
Short action	Regular	6 hours
Intermediate acting	NPH	12 hours
Long action	Glargine	24 hours
Mixed form	Combined short acting and medium acting at a ratio of 30:70	

- **Regimen:** (4 times/day injection regimen)
  - **3 bolus insulin**: with short acting insulin before each meal.
  - **Basal insulin**: Long acting insulin.

C. *Diet:*

- Food intake is divided into **3 main meals** with **snacks** between meals and before going to bed.
- **Snacks** are also given before exercise (avoid hypoglycemia).
- A **healthy diet** is recommended with:
  - A high complex carbohydrate (60%) (avoid simple CHO).
  - Low fat content (25% of total calories) (plant source is better).
  - The diet should be higher in fibers (prolonged release of glucose).

D. *Blood glucose monitoring:*

- Regular blood glucose measurements by **glucometer**.
- The target: Fasting **80-120** - Postprandial **100-140**
- It helps in early detection and management of hypo and hyperglycemia.

E. *Every 3 months:*

HbA1C measured every 3 months (4.5%-6%).

F. *Exercise:*

Regular exercise should be encouraged.

---

2. **Discuss precocious puberty:**

➔ *Definition:*

The appearance of secondary sexual character <8 yrs in girls and <9 yrs in boys.

➔ *Types and causes:*

A. Normal variant:

1. **Premature thelarche:**
   - Early breast enlargement without other signs of puberty (bet. 6 months and 3 years).
2. **Premature adrenarche (premature pubarche):**
   - *Definition:* Pubic hair develops before age of puberty.
   - *Pathogenesis:* Premature maturation of supra-renal androgens.
   - *Investigations:* exclude central precocious puberty.
3. **Gynecomastia in males:**
   - Breast enlargement in boys.
   - It may be a sign of puberty, local causes or hormonal causes.

B. Precocious puberty:

True precocious puberty (gonadotropin dependent)

- **Gonadotropin** level is high (pubertal).
- **Gonads** are enlarged (testes in males and ovaries in females).
- **Spermatogenesis** occurs in males and **ovulation** occurs in females.
- The main causes:
  - Idiopathic: 80% of cases in females and 50% of cases in males.
  - Organic causes: Secondary to CNS tumors, hydrocephalus, trauma and radiotherapy. (commoner in males).

Pseudo precocious puberty (gonadotropin independent)

- **Gonadotropin** level is low (prepubertal).
- **Gonads** don't enlarge.
- **Spermatogenesis** in males and **ovulation** in females don't occur.
- Causes:
  - In females: ovarian tumors or excess estrogen.
  - In males: testicular tumors or excess androgens.

---

3. Discuss delayed puberty:

➔ *Definition:*

Delayed secondary sexual characters beyond 13 yrs in girls and 14 yrs in boys.

➔ *Types and causes:*

1. *Constitutional delay of growth and puberty/familial: (the commonest).*
2. *Low gonadotropin secretion (hypogonadotropic hypogonadism):*
   - Systemic diseases: as cystic fibrosis, crohn's diseases, organ failure, anorexia nervosa.
   - Starvation, excess physical training
   - Hypothalamopituitary disorder.
   - Pan-hypopituitarism.
   - Isolated gonadotropin deficiency.
   - Intracranial tumors (including craniopharyngioma).
3. *High gonadotropin secretion (hyper-gonadotropic hypogonadism):*
   - ***Chromosomal abnormalities:***
     - Klinefelter syndrome (47 XXY).

- Turner's syndrome (45 X0).

- ***Steroid hormone (androgens-estradiol) enzyme deficiencies.***
- ***Acquired gonadal damage:***
  - Chemotherapy.
  - Radiotherapy.
  - Trauma.
  - Torsion of the testis.

IMPORTANT NOTES:

1. Most sensitive test for 1ry hypothyroidism → high TSH.
2. Most common endocrine disease → Diabetes mellitus.
3. First sign of puberty in females → Breast development.
4. First sign of puberty in males → Testicular enlargement.
5. Early manifestation of DKA → fever, vomiting, abdominal pain.
6. Gonadotropin is High → True precocious puberty.
7. Gonadotropin is LDW → pseudo precocious puberty.

Final exam – May 2018

1. List the principles of management of acute attack of bronchial asthma.

2. Outline the modified Jones Criteria

3. Describe the complications of acute gastroenteritis

4. Define growth and define development and enumerate the factors affecting growth.

5. Describe the clinical presentation and management of shock.

6. Summarize the work up of hemolytic anemia.

Intro: *Chronic and acute hemolytic anemia as "..."*

1. Chronic hemolytic anemia:

C/P: *general of them all and specific (if thalassemia .. if SCA .. etc.)*

Complications*: in brief (stress on specific complications as VOC in SCA)*

Investigations: *general and specific*

2. Acute hemolytic anemia:

Write the table (stress a bit on G6PD)

7. Enumerate causes of meningitis and describe clinical picture

8. Recall clinical features of congenital hypothyroidism

9. Identify the diagnostic approach to a case of neonatal jaundice

10. Mention clinical features and management of acute post-streptococcal glomerulonephritis.

Final exam - August 2018

1. **Define precocious puberty and mention its types.**
2. **Identify the causes and management of iron deficiency anemia.**
3. **Mention etiological causes and the required investigations for a case with acute renal failure.**
4. **Differentiate between the 5 main hepatotropic viruses.**
5. **Discuss the diagnostic investigations and preventive measures for tuberculosis.**
6. **Mention the diagnostic criteria and lines of treatment of infective endocarditis.**
7. **State the causes and management of a case with encephalitis.**
8. **Identify the protective mechanisms in human milk and differentiate between colostrum and mature human milk.**
9. **Define neonatal sepsis and differentiate between early and late onset sepsis.**
10. **State the causes and management of heart failure.**